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The Rwanda Journal of Medicine and Health Sciences is a peer-reviewed journal of the University of Rwanda that aims to publish three times a year. It publishes topics of special interest and those that have relevance to health-related fields including but not limited to medicine, pharmacy, dentistry, nursing, public health, nutrition, health management, and other health sciences. The journal accepts quantitative, qualitative and mixed method studies each evaluated for their scientific rigor and validity. The following types of manuscripts will be considered for publication in this journal: original research, review articles, short communications, letters to the editor, perspective articles, lessons from the field, editorials, case reports. The journal may publish supplements of conference proceedings or special editions.

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Editorial

Medical waste management

Jean Bosco Gahutu, Editor in Chief

"Above all do no harm" is a fundamental principle of medical practice. Obligation for health facilities and health professionals to do no harm is valid for the protection of the patients, the visitors, including patient family members, and the hospital staff. The hospital environment must be free of any hazard that can endanger the safety of patients, visitors or health professionals. For that purpose, emphasis is put on medical waste management.

Indeed, if inappropriately managed, hospital waste can constitute a danger to the health of patients, visitors and hospital staff. The nature of the hazard may be chemical, physical or microbiological among others. This is why medical waste management is of utmost importance to ensure a healthy environment in the hospital, thereby ensuring occupational health to the clinical and other hospital staff in addition to the protection of patients and visitors.

Quality improvement programmes are ongoing at Rwandan hospitals, aiming at meeting the requirements for accreditation; they include medical waste management.

The responsibility for medical waste management is collective, involving hospital management, clinical, allied and administrative staff and private companies in charge of cleaning and hygiene.

Proper management of hospital waste is of utmost importance for occupational health and safety.[1] Ensuring occupational health with regards to medical waste management involves several steps: protection of the hospital and cleaning staff in charge of waste disposal, which includes availing adequate equipment and materials for waste processing, transport and disposal. Protection must also be ensured for the hospital staff, patients and visitors in the vicinity of the area where the hospital waste is stored before disposal.

Equally important is the availability of materials for waste segregation, including colour-coded dustbins. Equipment and materials for waste disposal is important, including facilities for incineration.

Education of hospital staff and the staff of contractual companies in charge of cleaning and hygiene is crucial for them to have appropriate knowledge and attitudes and adequate skills in hospital waste management.[2] Relevant policies and guidelines are indispensable for effective hospital waste management.[3]

The article by Karenzi and collaborators published in this issue reports findings of a study on occupational health risks associated with medical waste management practices among health professionals working in three district hospitals in Rwanda. The results show that much effort is needed to raise the standards of medical waste management.

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M-health Tools Utilization of Tele-home Healthcare Services for Diabetes Management Among Youth in Kigali City.

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Abstract

Background

Self-care of diabetes for youth requires a daily self-active participation, which is complex and demanding. Effective patient engagement through technology tools may bring about compliance to healthcare 24 hours/ 7 days which minimises the diabetes complications and clinicians overload.

Objective

This study aimed to assess M-health tools utilization of tele-home healthcare services for diabetes management among youth in Kigali City.

Method

This cross-sectional study was conducted among the Rwanda Diabetes Association members. The study populations were youth diabetic patients residing in Kigali city. With simple random sampling, self-administered questionnaire was used to collect data for 122 participants. The raw data was entered into the Statistical Package for the Social Sciences (SPSS: 20) to perform descriptive and inferential statistics in data analysis.

Results

The mobile telephone is highly used in healthcare by participants (≥80%) with its functions such as Short Message Services, and the voice call is more useful (≥87%). Furthermore, occupation and education level of diabetic youth do not have significance influence ($p=0.825$ and $p=0.751$) over the use of a mobile telephone in healthcare. Radios and televisions are mostly used in healthcare education (93.5%).

Conclusions

Tele-home healthcare is practised in Rwanda but dominated by store and forward system. Mobile telephone, radio and television are mostly used whereas emails and social media are slowly used.

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Keywords: m-health, Tele-home, Healthcare service, and youth.

Introduction

Nowadays, Information Communication Technology (ICT) has been pivotal in healthcare service improvement. [1] The benefits of technology in healthcare delivery have been documented for synchronization of healthcare services in general and for chronic diseases management in particular. [2] Technology ensures the healthcare continuum with minimum cost. Thus, it not only reduces travel expenses and waiting time, but it also improves equity of healthcare access in remote areas and may lead to patients' satisfaction.[3]

Mobile-health care has strengthened self-care of diabetes patients through direct patient self-report of physiological changes taken at home or at workplace to the health professionals.[4] Self-report uses store and forward system (asynchronous) via logbook recording, short message, multimedia messaging or emailing.[3] It may also be synchronous via real-time system (synchronous) in which the patient interact with health professional through video-conferencing, mobile phone call and social media chat.[3,5,6]

Synchronous and asynchronous methods are primarily known to reduce healthcare cost through decreasing readmission, reduction of morbidity, frequency and length of hospital stay and mortality.[3] Hence, these methods improve efficiency in management of chronic diseases and data exchange among concerned health profession-

als, which drops down waiting time for a specialist appointment. [2,7]

The management of diabetes among Rwandan youths has been taken as crucial issues by Rwanda Diabetes Association (RDA) in order to improve the wellbeing of diabetic youth. RDA as private organization established a diabetes specialized clinic in Kigali. The main services of the clinic are the provision of information on diabetes management, training health care professionals and diabetes patients towards self-care ,behavior change, free consultation, supply of drugs, gluco-meter and its accessories.[8]

However, despite the commitment of Rwandan government to ensure good health for citizen, through the uses of appropriate technology and innovations in context of scarce resources, the extent of technology use in diabetes management is still unknown.[9,10] This paper focuses on assessment of M-health tools utilization of tele-home healthcare services for diabetes management among youth, identifying the existing tele-home healthcare framework for youth diabetes management and identifying technologies currently used by diabetic youth for home- patient centered care in diabetes management in Kigali.

Methods

Study design

A descriptive cross-sectional survey was performed to assess M-health tools utilization of tele-home healthcare services for diabetes management among youth in Kigali City. The target population was Rwanda Diabetes Association (RDA) youth members diagnosed with diabetes.

Sample size

The TARO Yamane formula (n=n/1+n (e) ^{2}, level of precision = 5%) was used to obtain a sample size of 122 participants' members of Rwanda Diabetes Association from 176 youth member residing in Kigali city (n= 176/1+176(0.05)^2 = 122). The Simple random sampling was used since all type 1 diabetes patients, members of Rwanda Diabetes Association, living in Kigali had equal chance to participate in this study.

Research instrument

A self-administered questionnaire was used for collecting data for this study. The questionnaire was developed with reference to literature focusing on tele home care technologies[5,6,11,12] and the components were demographic characteristics and the utilization of ICT tools available in Rwanda.

Data analysis

The collected data was digitalized and cleaned up in Microsoft Excel software whereas the statistical analysis was done by SPSS version 21. Descriptive statistics were used to analyze collected data while chi-square test was performed to determine the association between variables. In addition, statistical tests were taken as significant when $p<0.05$.

Ethical considerations

The Approval N^O: UR/RECC/156/2014 for conducting this study was obtained from the Research Ethics and Consultancy Committee of University of Rwanda, College of Medicine and Health Sciences which became Institutional Review Board. The researcher had explained to the participants the aim, the benefits of the study to the participants in particular and to the community in general. Finally, the participants voluntarily signed an informed consent form prior to participating in the study. The investigator respected the confidentiality and anonymity of the data.

Results

Demographic profile

The demographic profile of participants shows that 59% were female. The mean age was 20.3 years with standard deviation of 3.7 and the majority of the participants (52.5%) were 20 years old and below. With regard to participants' level of education, (70.5% had secondary and higher education while 41% were students, 34.4% were employed with unemployed participants reaching 24.6% (Table 1).

Table1. Demographic characteristics

Variable		Frequency	%
Sex	Female	72	59
	Male	50	41
	Total	122	100
Age (mean=20.3, SD=3.7)	≤20	64	52.5
	21-35	58	47.5
	Total	122	100
Education	Primary & lower	36	29.5
	Secondary & above	86	70.5
	Total	122	100
Occupation	Student	50	41.0
	Employed (public, private, self, informal)	42	34.4
	Unemployed	30	24.6
	Total	122	100

Existing Tele-home healthcare framework for youth diabetes management in Rwanda

The figure 1 shows that the patients collect their home measurements and record them in the logbook, and then they report those findings to clinicians during quarterly visit done by clinicians' team at the nearest district hospi-

tal, or the patients meet the clinicians at Fraternity clinic (face to face communication). Furthermore, the patients combine reporting via logbook by the synchronous and asynchronous systems via technology tools such as short text messages (SMSs), voice calls, emails and social media. The use of ICT tools by patients to communicate their home measurements does not require any physical contact between patients and the clinician (indirect communication). The clinicians also provide healthcare support for the patients without physical contact through the channels used by patients.

The following diagram of tele-home healthcare framework was developed to simplify the existing interaction and communication between diabetic youth and the healthcare providers. The contents were drawn from responses gathered from the instrument I used to collect data.

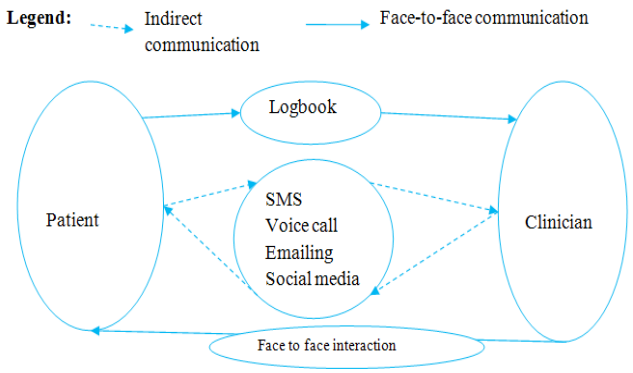

Figure 1. Tele-home healthcare framework This figure shows the existing tele-home healthcare framework of youth diabetes management in Kigali city. The diabetic youth interacts with health care provider through face to face communication by coming to health facility or bringing the logbook records to healthcare provider directly. On the other side, indirect communication is characterized by measurement of the glucose level and other vital signs at home record and transmitting them later to healthcare team through SMS, voice call, emailing or social media.

This study showed that most of the participants possess a glucometer at their residence (99.2%) comparatively to thermometer (27.7%) and blood pressure machine (13.2%) home possession (Table 2).The home measurement report is dominated by store and forward method through logbook (93.4%), short message text (22.3%) and chatting through social media (4.1%), whereas real-time vital signs reporting is done only through voice call (69.4%) (Table 2).

Table 2. Self-care tools, reporting means of home findings and healthcare education at home

		Yes n (%)	No n (%)
Self-care management tools	Glucometer possession (n= 121)	120 (99.2%)	1 (0.8%)
	BP machine possession (n=121)	16 (13.2%)	105 (86.8%)
	Thermometer possession (n=119)	33 (27.7%)	86 (72.3%)
Reporting the findings from patient home	Logbook record (n=121)	113 (93.4%)	8 (6.6%)
	Calling health professionals (n=121)	84 (69.4%)	37 (30.6%)
	Sending sms to health professionals (n=121)	27 (22.3%	94 (77.7%)
	Emailing to health professionals (n=121)	4 (3.3%)	117 (96.7%)
	Chatting with health professionals (n=121)	5 (4.1%)	116 (95.9%)
ICT tools used in healthcare education at home	Radio post (n=108)	101(93.5%)	7 (6.5%)
	Television post (n=106)	61(57.5%)	45 (42.5%)
	Social media (n=106)	21(19.8%)	85 (80.2%)
	Emailing (n=106)	11 (10.4%)	95 (89.6%)
	Mobile telephone (n=106)	54 (44.3%)	52 (42.6%)
	Other ICT tools (n=112)	18 (14.8%)	104 (85.2%)

Technologies currently used by diabetic youth for home-patient centered care for diabetes management in Kigali city.

This study indicates that 96.7% of participants possess a mobile telephone, 41.2% use social media, 40.8% use internet searching whereas 39.5% use email. Regarding the use of ICT in healthcare, most of the participants frequently use the mobile telephones (86.7%), following by internet searching (51.9%) then social media (41.2%) and finally 22.2% use emailing system (Table 3). Furthermore, the chi square test showed that there is no significant association between education level of participants and the use of mobile phones in healthcare services p=0.751, also occupation of participants like being student, public/private servants or unemployed does not have significant association with the use of mobile phones in healthcare services p=0.825, (Table 4). The data presented in Table 2 showed that radio was the most channel used by patients in health education programs 108 (93.5%), whereas emailing, other channels (iPod, YouTube, city flat screen, etc.) and social media were less used.

Table 3. Use of communication technology tools in healthcare services by diabetic youth

	Frequently n (%)	Rarely n (%)
Mobile telephone (n=120)	104 (86.7)	16 (13.3)
Internet searching (n=52)	27 (51.9)	25 (48.2)
Email (n=45)	10 (22.2)	35 (77.8)
Social media (n=51)	21 (41.2)	30 (58.8)
Other ICT tools (n=26)	4 (15.4)	22 (84.6)

Table 4. Association between Education Level and occupation of Participants and the use of mobile phone in healthcare services

		Mobile telephone services in healthcare		
		Frequently n (%)	Rarely n (%)	P-value
Occupation	Student	43(35.8%)	6(5.0%)	0.825
	Employed	35(29.2%)	7(5.8%)	
	Unemployed	26(21.7%)	3(2.5%)	
Education level	Primary	30(25.0%)	74(61.7%)	0.751
	Secondary and above	4(3.3%)	12(10.0%)	

Discussion

Demographic profile

This study shows that most of the participants are 20 years old and below (52.5%). As long as Rwanda counts 63% of 14-35-year-olds who are in the labor force,[13] some researchers recommended that it is crucial to avoid unnecessary travels and queuing at clinician office for this age group to seek the healthcare services which can be gained at workstation or at home as they are the active population.[14] It has been illustrated that the diabetes home management can reduce readmissions, long hospitalization and competition to nursing healthcare at health facilities which are still scarce in developing countries.[7,15–17] Thus, the telehome care for youth diabetes will promote their wellbeing physically and with cost effectiveness while seeking for healthcare services.

The gender proportion of participants showed that the number of females is greater than the number of males, 59% against 41%. These results are contrary to findings of the study done in Brazil where males were more numerous than females 60.6% and 39.3% respectively) [18]. This correlates with the national gender proportion where females are more than males, i.e. 51.8% against 48.2%. [19] Though, the diabetes management should be based on gender consideration as it was reported that the female had better knowledge than male about diabetes management.[18]

As far as Rwanda emphasises on youth forces, schooling is the first pillar to construct a nation. But diabetes in youth can impede education outcome because its management requires 24 hours a day, seven days a week.[14] As a solution to this impediment, M-health tools may help to monitor and manage glucose in the classroom promptly and consequently, alleviate the delay in monitoring and management of diabetes among the scholars. [20] This study finds that most of the participants have secondary education and higher level 70.5% and 41.0% are students, Rwanda Diabetes Association supports the diabetic youths to become independent and healthcare decision makers on their health management without queuing up at health facilities.[8] This intervention allows the students to stay at their schools while assuring diabetes care jointly with care received at home in order to avoid absenteeism of diabetes students.[21]

Current tele-home healthcare framework for teenagers and youth diabetic patient management in Rwanda

Rwanda Diabetes Association has settled various plans in order to respond to the needs of Rwanda diabetic patients especially the youth, by providing some free self-care tools and helping the adult people to get self-care tools at a lower price. The association also helps to train diabetes patients, health professionals and pro-acted for diabetes treatment innovations.[8]

Indeed, as it is illustrated in figure 1, the youth diabetic patients have the ability to communicate with clinician team through various means.

The youth with diabetes takes vital sign at home (blood sugar) record into the logbook and report the result to the clinician by face to face or Short Text Message (SMS), voice calls, emailing and social media. The means used by patients are followed by the clinician to provide any healthcare support.

Consequently, the Rwanda Diabetes Association (RDA) promotes M-health by availing two nurses responsible to respond the voice call or short text message (SMS) 24 hours per day, 7 days a week and visiting the diabetes face- to – face at a quarterly basis in district hospitals where the clinician team could assess the home measurements recorded in patient logbook.[8]

Self-management and technology tools used by home diabetic patient centred care system in Rwanda

The key element of youth diabetes management is active participation of the patient in bloodstream glucose control.[21] This control could not be successful without vital sign materials at patient's residence. Since glucometers are given free of charge by Rwanda Diabetes Association, the availability of glucometer at home is a first pillar of self-care of diabetes.

However, the low use of other vital sign measurements at home such as blood pressure machine, thermometer and scale impede tight self-control of diabetes and other associated complications such as cardiovascular diseases, malnutrition, and improvement of lifestyle for youth who are normally occupied by schooling and productive business.[22] Hence, reporting vital signs taken at home is a milestone of m-health to manage diabetes. Though, the means of reporting home findings are dominated by store and forward methods by which the patients record their measurement first into logbook, and later, they report them to healthcare providers during clinicians' visits at their health facilities.

However, other technology tools can sometimes be used to transmit home recorded data like Short Message Services (SMS) or call. These practices had shown inefficacy to self-management of diabetes and its complications as was illustrated in the study done in France: 'reporting by logbook was considered with doubtable efficacy since data could be wrongly filled, incorrectely recorded or delayed to be reported to clinicians'.[23] As a consequence, the clinician can intervene on wrongly findings or delay supporting the patients in a critical situation.[24]

Indeed, automatic reporting home measurement using mobile phones could be enhanced instead of storing and forwarding system. The combination of vital sign materials and portable telecommunication at patient's home offers channels for propagating a message on critical vital sign findings, risk factors, and long-term complications to the clinician team.[15]Thus, the sustainable solution could be directed to the use of a personal wireless system synchronizing all required patient information and facilitate the mutual exchange between patient and clinician.[25]. Hence, automated reporting system could be promoted regardless the education level of diabetic youths in RDA.

However, automated reporting system requires minimum technology tools. This study revealed various technology tools used by youth diabetic patients in RDA on daily basis. Among them, mobile phones are highly used, these results are aligned with the national mobile phone penetration in Rwanda, particularly in Kigali where 79.6% of the residents own mobile telephone.[26] Thus, this technology penetration rate among youth diabetes is a great asset to change the ways health care providers are using technology through integrating tele-home care in their framework.

This tremendous use of a mobile telephone in healthcare provision is an indicator of its higher user friendliness. [15,27] In this line, the studies revealed that mobile telephone accessibility and user friendliness,[27] allow youth diabetic patients to feel comfortable to use it when calling or sending an SMS for healthcare purposes. Simple mobile telephone services (voice call and SMS) are used more than other telecommunication means available in Rwanda, and this stressed that voice call and SMS may be better and simpler medium of communication in healthcare services, especially in diabetes self-management process for people with poor resources in developing countries. Consequently, any intervention applied to a mobile phone will be warmly welcomed with high success depending on experience to use mobile phone features as there is no influence of education level and occupation domain over the use of a mobile telephone in healthcare services ($p=0.751$; $p=0.825$).
Even though youth diabetic patients are aware of the importance of home self-management, healthcare education at home is one of success inducer and cannot exist without Information Communication Technology tools. Health education through ICT tools is a solution for youth to keep them at school or workstation considering that face-to-face health education, traditional intervention consumes time and money for both patients and healthcare providers and have not been successful in reaching all patients at the right time.[28]

This study found that most of the participants benefit from healthcare education at home or workstation through radio post rather than other telecommunication channels like television post, mobile telephone, emailing and chatting through social media. The low use of these channels may reduce disease awareness as other studies illustrated that 'Internet technologies strengthen

diabetic patient self-management through increased disease awareness, health education, and social support.[16] Though, healthcare education through radio needs to be beefed up by visual and movie technology tools as other studies have shown that learning through seeing and doing is better than learning by hearing. 'If I hear it, I forget it; if I see it, I remember it; if I do it, I know it' old Chinese saying.[29] In this regard, videoconference, television, emailing, and social media can be more effective in health education because simulation practice on diabetes management can be played through television, sent on email, or posted on wall of patient group social media account in order to increase skills and knowledge in self-management at home.[30]

Conclusion

The existing tele-home healthcare framework for youth diabetes management in Kigali city is dominated by store and forward system through which the youth diabetes record the home measurement data and forward findings later to healthcare providers for further interventions. Hence, to transmit home findings, the youth diabetes use different ICT tools; mostly they use the mobile telephone to interact with healthcare provider team and radio post for healthcare education at resident or workstation. However, there is no synchronised system to facilitate remote patient and clinician automatic interaction. Furthermore, email and social media useful to interact with healthcare provider team are slowly used in both reporting the home measurement as well as in diabetes education.

Recommendation

RDA and its partners are recommended to synchronize the reporting of home measurements via mobile phone application as clinical monitoring and management tool for diabetic patients. In addition, healthcare education through radio, televisions and other ICT tools could be strengthened in order to boost diabetes self-management awareness in Rwanda.

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Authors'contribution

All authors have contributed in writing of this article.

Conflict of interest

No conflict of interest

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Community Health Workers' Attitude Towards People with Mental Illness: Potential Challenge of Maternal Mental Health Services in a Selected Health Centre, Ruhengeri Hospital in Rwanda

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Abstract

Introduction

Integration of mental health services into non psychiatric health care facilities from community level was recommended by the world health organization (WHO) in 1984 to improve the quality of mental health services provided to the local population. Community Health Workers (CHWs) have an important role to play for the implementation of WHO recommendation of integration especially at the community level. Research objectives were to: Describe attitude among CHWstowards people with a mental illness and explore relationships between socio-demographic variables and CHWs' attitude towards people with mental illness in Muhoza health center/Ruhengeri hospital in Rwanda.

Methods

In this study, a quantitative descriptive cross-sectional design was used to conduct a research among CHWs operating under Muhoza health centre/ Ruhengeri hospital in Rwanda. A self-report questionnaire was used to collect data on a sample of 138. Questionnaire consisted of sociodemographic variables and two sections that include level of contact (LOC) and the Community Attitude towards Mental Illness-Swedish version (CAMI-S). The statistical package for social sciences (SPSS) version 22 was used to analyze data.

Results

Findings showed negative attitude among community health workers in regards to people with mental illness (MI). The participants' total score on the CAMI-S was ranging between 25% and 87%. This study revealed that participants with lower level of education and less experienced as CHWs reflected higher negative attitude in regards of people with mental illness than participants with higher level education and more experienced. Also, results from this study indicated that increase in LOC correlates with decrease in fear and avoidance towards people with mental illness.

Conclusion

Community health workers in a selected Health Centre/ Ruhengeri Hospital, in Rwanda hold negative attitudes towards people mentally ill. Also, there is association between negative stereotypes towards people mentally ill and the level of education and experience. Familiarity has a mediating effect on negative attitudes hold by community health workers in regards to people mentally ill.

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Keywords: Community health workers, mental illness, health centre, negative attitude.

Introduction

Mental illnesses (MIs) are psychiatric clinical conditions characterized by a significant behavioural and psychological pattern associated with distress and impairment in different areas of functioning. The American psychiatric association stated that persons with mental illness can be disconnected with the reality (example, psychotic disorders) and others not (example; personality disorders, psychosomatic disorders, anxiety disorders).[1] In addition, mental illnesses are categorised into three levels according to their severity (mild, moderate and severe). For example literature differentiates major depression from minor depression. [1] Mental illnesses are common and affecting countries worldwide and represent 13% and are expected to rise up to 15% by the year 2020[2,3]MIs are among four leading causes of disability whereby 30% of disability cases were reported to be related to mental illness.[2,3] In 1984, WHO recommended worldwide countries to integrate mental health services, to overcome problems associated with mental health issues that are affecting

the population locally and globally. The process of such integration was suggested to start from community based health care facilities up to referral health care facilities in 2005.[4] The Rwandan Government was highly interested by such integration as long as Rwandan citizens faced a tragedy of Genocide against Tutsis in 1994. The genocide against Tutsis significantly affected the Rwandan population and led to psychological traumatism that was influencing mental health services in Rwanda.[5,6] the Rwandan Ministry of Health started to integrate mental healthcare from the community to referral level of health care settings since 2005.[6,7] For its implementation, the Rwandan Ministry of Health suggests that such integration at community level, relies on Community Health Workers who are involved in promotive, preventive, curative and rehabilitation activities for the local population mental illness.[7,5] The CHWs package of activities includes health related services such as sensitization and health education for prevention of mental illness and mental health promotion.[5,8,9] The CHWs are not considered as health care professionals but they work jointly with nurses and other health professionals from health centres. CHWs are trained, supervised and supported by the Health Centre. CHWs are also involved in some activities planned and implemented by the Health Centre at the community level in favour of maternal and child health.[5,8,10] Maternal health includes maternal mental health during pregnancy, during and after delivery.

Current literature suggests that having integrated mental health services in different heath care facilities would reduce negative attitude held by the public towards mental illness. However, in some countries like Zambia, Nigeria, Uganda and Ghana it has been shown that professionals have negative attitude in regards to people with mental illness. This issue of negative attitude in regards to people with mental illness was found among health professionals in rural District (Uganda) and in primary Health Care (Zambia).[10–12]

CHWs as a part of the general population may also reflect negative attitude towards people with mental illness. [13,14] However, there are few known local research data regarding stigma associated with mental illness among the general population and health professionals particularly including CHWs. Similar studies were conducted among nurses and student in school of nursing, who are argued to be part of the implementation of integrated care. [15,16] There is no doubt that the issue of negative attitude and stigma in general is a potential obstacle to the mental health services integration into different levels of health care settings.

This study aims to describe attitudes in regards to persons with mental illness among CHWs operating in the catchment area of Muhoza Health Centre in Ruhengeri hospital in Rwanda. This is aiming at informing anti stigma initiatives to reduce stigma amongst CHWs. The CHWs are argued to have an important role in Rwandan health care system regarding maternal and child health.

Methods

Design

The current study was conducted using quantitative, descriptive and non-experimental design that makes use of a self-report questionnaire to facilitate an audit of the attitude of community health workers with regard to mental illness. The design facilitates the researcher's ability to access and describe attitude of community health workers towards persons with mental illness in Muhoza health centre/ Ruhengeri hospital in Rwanda.

Study setting and participants

The study has been conducted in Muhoza health centre/ Ruhengeri Hospital in Rwanda that is a community health care facility. The target Health Centre was conveniently sampled because of its location that was near the researcher work place when he was supervising students during community clinical placement. Also, the researcher had established a relationship with the head of Muhoza health Centre.[17] Muhoza Health Centre provides comprehensive and primary health care including outpatient consultation, maternity, antenatal care, immunization, Voluntary Counselling and Testing, preventing mother to child transmission of human immunodeficiency virus (HIV). Also, health centre supervises and coordinates activities provided by CHWs and Health posts operating under its responsibility. In addition, mental health services are integrated into the package of activities of Health Centre (basic mental health services) according to WHO suggestions about the essential medication.[18] Muhoza health centre has 22 nurses providing health services at health centre setting and organizing home visits in the community setting where community health workers are found and work from.

All Community Health Workers (CHWs) operating in the catchment area of Muhoza health Centre and who deliver different health services to the local population, were included in this study. The catchment area of Muhoza health centre includes 26 villages from Muhoza sector, 12 villages from Musanze sector and 11 villages from Cyuve sector. Villages served by Muhoza Health Centre make a total of 49 villages that have 147 community health workers as each village has 3 community health workers. Villages and community health workers were not sampled to obtain sufficient numbers for statistical power in the data analysis that necessitated at least 100 participants. Of 147 community health workers operating under Muhoza health centre, 138 community health workers were available and accepted to participate in this study which allowed achieving a response rate of 93.8%.

Instruments

To conduct this research, the researcher decided to use self-report questionnaire to collect data on attitude among community health workers in regards to persons with mental illness. This tool has been adopted from the original level of contact scale (LOC) as developed by Corrigan and colleagues in 2001 and the original

Community Attitude towards Mental Illness Swedish version as developed by Högberg and the researchers' team in 2008 in Sweden. The self-reported questionnaire was composed of three sections. First section includes socio-demographic variables (age, gender, experience and level of education). In this study socio-demographic variables are taken as independent variables

The second section is about familiarity (level of contact) as developed by Corrigan & his research group in 2001. [19] The level of contact consists of twelve levels ranging from "Never observed a person with mental illness" to "I have mental illness" and was considered as dependant variable. The level of contact scale was developed to measure the extent of participants' familiarity towards persons with mental illness. The tool was previously used by different researchers internationally and locally. For example, in Sweden by Martensson and colleagues (2009), in Nigeria by James and the research team (2012), Adewayu and Maknjuola (2008) and in South Africa by Smith and Middleton (2010).[20–22] Holmes and Colleagues reported the reliability of LOC to have inter item of 0.83.[23]

The third section was about Community Attitude towards Mental Illness Swedish version (CAMI-S). This section has three subscales which make a total of 20 items: open minded and pro-integration subscale (9 items); fear and avoidance subscale (6 items); and community mental health ideology subscale (5 items). The Community Attitude towards Mental Illness Swedish version (CAMI-S) [24] has been reported to have good reliability, on the 20 items (0.903) generally. In this study the subscales and total score on the Community Attitude towards Mental Illness Swedish version were considered as dependent variables.

Both level of contact scale, and community attitude towards Mental Illness- Swedish version were in English and the translation was done from English to Kinyarwanda by a translation expert person working at the CMHS centre of language enhancement. The translation was done due to the fact that CHWs do not have ability to express themselves in English, thus local language is highly recommended to be used.

Data collection procedures

A meeting was held with the Head of Muhoza health centre and in charge of community health in Muhoza health centre to discuss about the process of data collection. The head of Muhoza health centre was contacted before community health workers because the health centre supervises and coordinates all community health workers activities.

The researcher and the head of Muhoza health centre agreed on schedule according to the working hours especially when community health workers were invited at Muhoza health centre for any activities; such as the meetings. Implied consent was used by the researcher for the participants by giving back the self-report questionnaire to the researcher. The researcher took this opportunity to collect data but without disturbing scheduled activities as appointment for collecting data was always placed at the end of their activities at Muhoza health centre. Also, the researcher connected telephonically with the executive secretaries of cells served by Muhoza health centre (Muhoza sector: 4 cells, Musanze sector: 2 cells and Cyuve sector: 2 cells) to facilitate meeting with community health workers of respective cells, who did not meet with the researcher at Musanze health centre. The researcher collected data from available participants and Information sheets were distributed to available community health workers who accepted to participate in the current study. Participants were given the opportunity to ask questions before starting the data collection. Collected data was kept in a sealed envelope provided by the researcher.

Analysis of data

The statistical package of social sciences (SPSS), Version 22 was used to analyse data. On section two that contained 12 statements (LOC), the single highest score was recorded because the participants were asked to tick on each statement applicable to them. On section three (CAMI-S) reverse scoring was used on the following items 4,5,6,10,11,12,13,17 and 20. The remaining items (1,2,3,7,8,9,14,15,16,18 and 19) were not reversed. The reverse scoring was done because the statements mentioned above were expressing negative attitude towards persons with mental illness while scale starts by less stigmatizing attitude to more stigmatizing attitude (strongly agreeing with the statement (1) agreeing with the statement (2) neutral (3), disagreeing with the statement (4) and strongly disagreeing with the statement (5). This is why the reverse was performed on the mentioned statements and resulted in the following scoring: Strongly agreeing with the statement (5) agreeing with the statement (4) neutral (3), disagreeing with the statement (2) and strongly disagreeing with the statement (1).

Regarding descriptive statistics, the range (minimum and maximum), mode (most commonly occurring score), median (the middle score when the score are ranked from smallest to largest and sometimes known as the midpoint), skewness statistic and standard error of skewness statistic (values that provide an indication of the symmetry of distribution), and quartiles, were used. Percentages, proportions, range, mean and standard deviation of subscales and total score on the community attitude towards mental illness- Sweden version, were computed. An independent t-test was used to compare the mean score of CAMI-S subscale for males and females (association).One way between groups analysis of variance (Post Hoc Tests) was conducted to test relationship between independent (age, level of education and experience) variables and CAMI-S subscales and total score.[25] Correlation was tested by using the Spearman's rho correlation coefficient test and the correlation was tested between level of contact (LOC) and CAMI-S subscales and total score.[25]

Ethical Considerations

Before starting the data collection, the ethical clearance

has been offered by the CMHS institutional review board (No 020/CMHS/IRB/2016). Also, a permission to conduct a research was given by the District of Musanze (No 0662/07.04.03) as an administrative structure that supervises all activities of health institutions including Muhoza health centre. Implied consent was used to reduce social desirability bias which is argued to influence participants' responses. The choice to use implied consent was aiming at boosting the issue of anonymity and confidentiality. [17] Here, the implied consent was considered by the researcher as consent to participate in research on certain actions of the participant, such as returning a completed questionnaire.[17,26] In additionCHWs are not vulnerable persons and there were not noticed any risks. The study was a low risk research as long as it was not argued to harm the participants. There was no incentives that could influence participant's responses.[17,26]

Results

Study participants characteristics

The total number of participants was (n=138) and the majority included female participants (n=80; 58%) and minority of male participants (n=48; 42%). Distribution of participants according to their age was as follows; age 18-21 (n=32; 58%); 22-25 (n=52; 47.7%); 26-30: (n=23; 16.7%) and < 30: (n=5; 3.6%). Regarding the education level, data was distributed as follows; participants without completing primary school (n=32; 23.2%), those who completed primary school (n=102; 73.9%), O' level (secondary school (n=4; 2.9%) and University level (n=0; 0%). Lastly, the majority of participants were experienced between 3-5 years of experience (n=50; 36.2%); followed by less than 1year (n=39; 28.3%); < 5 years (n=25; 18.1%) and 1-3 years of experience (n=24; 17.4%).

Table 1. Sociodemographic data distribution

Sociodemographic variables	Frequency	Percentage
Gender of participants		
Female	80	58%
Male	58	42%
Total	**138**	**100%**
Age of participants (in years)		
18-21	58	32%
22-25	52	47.7%
26-30	23	16.7%
<30	5	3.6%
Total	**138**	**100%**
Experience of participants (in years)		
0-1	39	28.3%
1-3	24	17.4%
3-5	50	36.2%
<5	25	18.1%
Total	**138**	**138**
Level of education of participants		
Primary not completed	32	23.2%
Primary	102	73.9%
Secondary	4	2.9%
University	0	0%
Total	**138**	**100%**

Level of contact (LOC)

Data from the LOC included the participants' highest score only, with a single score being recorded to represent participants' greatest level of intimacy from 12 situations with a person with a mental illness.

The level of contact among the participants was measured by the LOC scale as described in the section of research instruments. The study participants 'level of contact was ranged between "*observed a person with mental illness in passing*"(0.6%) and "*I have mental illness*"(8%). The highest score on the LOC was considered to be reported and the participants were asked to tick on every statement applicable to them. The highest score on the LOC was considered by the researcher to be included into the calculation of percentages in regards to LOC with persons with mental illness. The level 7 was the highest score achieved by participants on the LOC "providing *services to person with severe mental illness"*(19.6%). This highest score is not surprising as long as community health workers provide promotion, preventive, and rehabilitation services to the population within the community including persons with mental illness.[5]

Participants' attitude towards persons with mental illness

As displayed in Table 2, findings were expressed in percentages to show the level of agreement or disagreement by participants on each statement. Also, findings from this study confirm that the participants reflected negative attitude in regards to mental illness on all items of the CAMI-S. This negative attitude among community health workers was evidenced by the fact that some participants were in certain disagreement with the statements. However, Table 3 indicates that negative attitude was less prevalent on the following items than others: Item 16: *The best therapy for many mental patients is to be part of a normal community with* 18.8% of participants who disagreed and 67.8% of participants who agreed with the statement. Also, participants reflected more positive attitude towards persons with mental illness: item 18: *As far as possible, mental health services should be provided through community-based facilities* (68.8%) and item 8: *We need to adopt a far more tolerant attitude towards the mentally ill in our society* (68.8%).

Table 2 shows that negative attitude was more prevalent in the item 12: *It is frightening to think of persons with mental problems living in residential neighborhoods* whereby only a half (49.3%) of participants disagreed with the statement.

The findings from the current study suggest contradictions amongst participants regarding different items. Significant contradictions were revealed on the item 19: *No one has the right to exclude the mentally ill from their neighborhood* and item 8 "*We need to adopt a far more tolerant attitude towards the mentally ill in our society*" compared to the item 12 "*it is frightening to think of persons with mental*

problems living in residential neighbourhoods "and item 5: *Having mental patients living within residential neighborhoods might be a good therapy, but the risks to the residents are too great.* The study participants were for the opinion that community members need to adopt far more tolerant attitude persons with a mental illness and mental health services being provided through the community-based facilities. While at the same time the participants believe that it is frightening to have persons with mental problems living in residential neighborhoods. In addition, participants support the idea of providing mental health services in community-based health care facilities, while they consider residents to have a great risk when they are living with persons mentally ill.

Also, the current study revealed neutral responses on all items for the Community Attitude towards Mental Illness- Swedish version. However, on item 5: *Having mental patients living within residential neighborhoods might be a good therapy, but the risks to the residents are too great,* participants reflected more neutral responses than positive attitude whereby 26.8% agreed; and 31.9% neutral responses. It is possible that the extent of neutral responses within this study is also a reflection of ambivalence thus suggesting that participants preferred to take a neutral position rather than exhibiting negative attitudes towards people with a mental illness.

Table 2. Community Attitude towards Mental Illness- Swedish version

Item statements	Participant responses				
	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Open minded and pro integration subscale					
1. Residents should accept the location of mental health facilities in their neighbourhood to serve the needs of the local community	37%	23.2%	13.8%	10.9%	15.2%
2. Most persons who were once patients in a mental hospital can be trusted as babysitters	23.9%	23.2%	15.2%	29.2%	8.0%
3. Locating mental health services in residential neighbourhoods does not endanger local residents	21.7%	29.7%	18.1%	26.1%	4.3%
4. Mental health facilities should be kept out of residential neighbourhoods	23.2%	23.9%	9.4%	31.9%	11.6%
5. Having mental patients living within residential neighbourhoods might be a good therapy, but the risks to the residents are too great	9.4%	17.4%	31.9%	31.9%	9.4%
6. Local residents have good reason to resist the location of mental health services in their neighbourhood	24.6%	20.3%	23.9%	23.9%	7.2%
7. Mental illness is an illness like any other	34.1%	32.6%	8.7%	17.4%	7.2%
8. We need to adopt a far more tolerant attitude towards the mentally ill in our society	42%	26.8%	11.6%	9.4%	10.1%
9. The mentally ill are far less of a danger than most persons suppose	24.6%	37%	10.1%	23.9%	4.3%
Fear and avoidance subscale					
10. It is best to avoid anyone who has mental problems	23.2%	26.8%	13%	19.6%	16.7%
11. I would not want to live next door to someone who has been mentally ill	18.8%	24.6%	17.4%	29%	10.1%
12. It is frightening to think of persons with mental problems living in residential neighbourhoods	8.7%	13.3%	8.7%	29%	20.3%
13. The best way to handle the mentally ill is to keep them behind locked doors	26.1%	23.9%	13%	18.8%	18.1%
14. Residents have nothing to fear from persons coming into their neighbourhood to obtain mental health services	23.2%	34.8%	17.4%	17.4%	7.2%
Community mental health ideology subscale					
15. Less emphasis should be placed on protecting the public from the mentally ill	16.7%	28.3%	18.8%	25.4%	10.9%
16. The best therapy for many mental patients is to be part of a normal community	27.5%	41.3%	12.3%	9.4%	9.4%
17. The mentally ill should not be treated as outcasts of society	41.3%	26.1%	8.0%	8.7%	15.9%
18. As far as possible, mental health services should be provided through community-based facilities	34.8%	26.1%	15.2%	15.2%	8.7%
19. No one has the right to exclude the mentally ill from their neighbourhood	41.3%	27.5%	9.4%	10.9%	10.9%
20. The mentally ill should be isolated from the rest of the community	41.3%	13.8%	10.9%	15.9%	18.1%

Table 3 displays subscales and total scores achieved on the CAMI-S. Measures of central tendency (mean, standard deviation) and distribution indicated more negative attitude towards mental illness on subscale 2 "fear and avoidance"

(Mean=58.83; Std. deviation=16.082) than subscale 1 "Open minded and pro integration" (Mean=52.13; Std. deviation=17.365) and subscale 3 "Community mental health ideology" (Mean=47.16; Std. deviation=21.257). Findings from this study indicated that the extent of negative attitude in regards of mental illness between fear and avoidance subscale, open minded and pro integration subscale and Community mental health ideology subscale is almost similar.

The total scores achieved on the CAMI-S reflected a slightly skewed distribution and this skewness, is influenced by fear and avoidance subscale.

Table 3. Results of subscales and total score on Community attitude towards Mental illness Swedish version

		Open minded and pro integration	Fear and avoidance	Community mental health ideology	Total score
N	Valid	138	138	138	138
	Missing	0	0	0	0
Mean		52.13	58.83	47.16	52.28
Std. Deviation		17.365	16.082	21.257	15.546
Skewness		.198	.059	.669	.353
Minimum		20	23	20	25
Maximum		91	87	100	87

Associations between socio-demographic variables and CAMI- S subscales and total score and correlations between the level of contact and CAMI- S subscales and total score

Prior to perform any statistical tests, percentages, proportions, mean and standard deviation on CAMI-S subscales and total score were computed. Associations between socio-demographic variables and the CAMI-S subscales and total score, were tested and only significant associations were reported.[25] An independent – samples t-test was used to compare the mean score of CAMI-S subscales and total score for males and females.[25] The significant difference was considered when the significance level of Levine's tests is p=.05 or less. Findings from this study revealed no significant difference on CAMI-S subscales and total scores for female and male participants.

Also, a one way between groups analysis of variance (Post Hoc Tests) was conducted to explore relationship between independent variables (age, experience and the level of education) and CAMI-S subscales and total score. Comparison of mean scores of CAMI-S subscales for participants groups was computed. These participants groups include; age groups (group 1: 18-21 years, group 2: 22-25 years, group 3: 26-30 years and group 4: 31 years and above), participants experience groups (group1: less than 1 year, group 2: 1-3 years, group 3: 4-5 years and group 4: above 5 years) and participant level of education groups (group 1: not completed primary school, group 2: completed primary school, group 3: secondary school). The statistical significance was considered if the significance value is less than or equal to .05.[25]
The Post Hoc Tests revealed no statistically significant difference in CAMI-S subscales and total scores for four participant age groups. However, a statistically significant difference in CAMI-S subscales and total score for four participants level of education groups was found Open minded and pro integration (F=18.642; p=.000); fear and avoidance (F=10.865; p=.000); community mental health ideology (F=6.935; p=.001); total score (F=17.332; p=.000). In addition, the significant difference was confirmed by measures of central tendencies (mean and standard deviation as displayed in Table 4.

The mean and standard deviation showed that both participants who completed primary school and secondary school recorded lowest scores, with participants who did not completed primary school recoding the highest score on two subscales (subscale 1; open minded and pro integration and subscale 3; community mental health ideology) and the total score. The findings indicate that participants who completed primary school and secondary school reflected less negative attitude towards persons with mental illness than participants who did not completed primary school on CAMI-S subscales 1 and 2 and the total score. However, in regards to fear and avoidance subscale, the mean and standard deviation showed that participants who completed secondary school reflected less negative attitude towards mental illness than the two remaining groups.

Finally, the Post Hoc Tests revealed statistically significant difference in two CAMI-S subscales (subscale 2; fear and avoidance and subscale 3; community mental health ideology) for four participants' experience categories groups (group 1: less than year, group 2: 1-3 years, group 3: 4-5 years and group 4: above 5 years). Fear and avoidance (F=6.055; p=.001); community mental health ideology (F= 5.598; p=.001). Also, the significant

difference was confirmed by measures of central tendencies (mean and standard deviation as displayed in the table 4. The mean and standard deviation showed that more experienced participants recorded lower score on two CAMI-S subscales (fear and avoidance and community mental health ideology) than other remaining participants groups (group 1: less than year, group 2: 1-3 years, group 3: 4-5 years) recoding highest mean difference results. This mean difference result indicates that more experienced participants reflected less negative attitudes than less experienced participants towards mental illness.

Table 4. Associations between socio-demographic variables and community attitude towards mental illness subscales and the total score and correlations between the level of contact and community attitude towards mental illness subscales and the total score

		Open minded and pro integration	Fear and avoidance	Community mental health ideology	Total score
Associations					
Education					
Mean	*No primary education*	37.59	45.97	35.63	39.63
	Primary education	*56.29*	60.08	50.35	35.92
	Secondary education	*62.25*	60.75	58.00	60.75
SD	*No primary education*	*12.072*	13.231	14.128	10.951
	Primary education	*16.472*	15.716	22.134	14.862
	Secondary education	*12.203*	6.994	12.437	10.275
p		*.000*	.000	.001	.000
Experience					
Mean	> 1 year	51.15	51.31	44.41	49.49
	1-3 years	52.04	53.29	38.17	48.92
	4-5 years	52.42	57.62	46.80	52.58
	< 5 years	53.16	56.83	47.16	59.28
SD	> 1 year	13.716	14.194	20.474	13.050
	1-3 years	16.633	16.633	17.173	15.120
	4-5 years	17.681	16.605	19.365	15.939
	< 5 years	22.741	16.082	21.257	17.230
p		.974	.001	.001	.057
Correlation (dependent variable: LOC)					
rho		023	-.242	-.007	-.066
p		.792	.004	.937	.937

A Spearman's rho correlation coefficient was used to test correlation between the participants level of contact and score achieved on the community attitude towards mental illness- Swedish version subscales (subscale 1; open minded and pro integration, subscale 2; fear and avoidance and subscale 3; community mental health ideology); and the total score. Statistically significance was considered if $p<.05$ and only significant correlation is reported.[25] The spearman's rho correlation coefficient revealed negative correlation (rho=-.242; p=.004) between participants level of contact and subscale 2 (fear and avoidance). The negative correlation indicates that increases in level of contact correlates with a decrease in score achieved on the fear and avoidance subscale. However, no correlation was found between the level of contact and subscale 1 (open minded and pro integration) and subscale 3 (community mental health ideology) and the total score.

Discussion

This study revealed negative attitudes among CHWs towards people mentally ill. Participants seemed to agree with the idea emphasising on mental health care being integrated into community-based health care facilities, located in communities. This issue of negative attitudes among CHWs towards persons with mental illness could be a potential obstacle for mental health care integration in health care facilities from the community level to central level. At the same time the community based care relies on CHWs who are involved in preventive, curative and rehabilitation services for any diseases that

could occur among the community members especially mothers and children.[5,7]

Negative attitude among CHWs will negatively impact maternal health of mothers exposed to develop mental problems particularly before, during and after delivery (perinatal period).

These findings about negative attitude towards people mentally ill are similar to findings from both international and local studies that revealed negative attitudes among the general population and health professionals. For example a study conducted by Barke and colleagues in southern Ghana (2011), revealed negative attitudes towards people mentally ill among urban population. [27] Barke findings were in line with a study conducted (2010) in Nigeria university teaching hospital by Ukpong and colleagues among medical students.[28] In Malesia, a study conducted by Mas and Hatim (2002) revealed stigmatizing attitude among medical students.[29] Similar results were found in a study conducted among South India non-psychiatry medical professionals in an university teaching hospital by Sathyanath and colleagues (2016) reflecting a social restrictive attitude towards persons with mental illness.[30] Negative attitude in regards to mental illness, is not a concern for developing countries only. A study conducted in Sweden by Hogberg and his research team (2008) revealed stigmatizing attitude towards people mentally among the general population. [31]

Also, the current study showed contradictions and neutral positions among CHWs in regards to persons with a mental illness. The neutral and contradictive responses from the participants might be eventually considered as the outcome of social desirability bias.[32,33] This is in line with the United Nations declaration and Rwandan constitution in regards to human rights. The UN declaration and Rwandan constitution emphasize that human beings are equal and must be protected from any form of discriminatory actions.[34,35]

While contradictions and neutral answers were found among the participants, findings from this study showed associations between education level of participants and CAMI- S subscales (open minded and pro integration, fear and avoidance and community mental health ideology) and the total scores. These results are similar to studies conducted by Barke and colleagues in Ghana (2011), Song and colleagues in Taiwan (2005) that revealed association between the level of education and negative attitudes towards people mentally ill.[27,36] Also, association were found between experience of community health workers and subscales 2 (fear and avoidance) and 3 (community mental health ideology). These findings are in line with several local and international studies. For example in the study conducted in western Nigerian in 2007 by Adewaya and Oguntande an association was found between experience and attitude towards people mentally ill.[21] Bjorkman and colleagues (2008) in Sweden, found association between experience and stigmatizing attitude towards persons with mental illness among nursing staff.[37]

Lastly, the current study revealed correlation between the level of contact (LOC) and the subscale 2 (fear and avoidance). These findings are congruent with studies conducted by Corrigan and colleagues (2000) and Holmes and colleagues (1999) suggesting that familiarity with people mentally ill correlates with stigmatizing attitude.[20,24] However, these findings are in contrast with other previous studies conducted by Smith and Middleton in South Africa (2010) and James and colleagues in Southern Nigeria (2012) that revealed no correlation between familiarity and negative attitudes in regards to persons with mental illness.[21,39]

Conclusion

The study revealed negative attitudes among community health workers in regards to persons with mental illness. Although participants seemed to agree, in principle, that mental health care facilities can, and should be, placed in communities, they also expressed a desire for social distance from persons with mental illness. These contradictions and high levels of neutral responses may suggest that the responses reflected social desirability bias. Level of education and experience of community health workers, were associated with negative attitudes in regards to persons with mental illness. Lastly, familiarity had a mediating effect on negative attitude and may be the foundation for changing attitude within general health care settings.

To clarify the contradictions and neutral position, experimental studies among community health workers are needed to explore the effectiveness of familiarity in reduction of negative attitudes towards people with mental illness among community health workers. Considering the current evidence, it is suggested to the Rwandan Ministry of Health to organize several training sessions to community health workers about mental health. Also, collaboration with the mental health unit in Ruhengeri hospital is highly considered to increase their level of contact with persons with mental illness. Lastly, local authorities should encourage highly educated population (high school and university) to be enrolled among community health workers who are suggested to be highly contributing and involved in the health care system in Rwanda.

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Conflicts of interest

No conflict of interest as longer as the study was not funded by any institution or organization. Also, the study was conducted by two researchers who declare no conflict of interest.

Author contributions

VB participated in conceptual design, empirical analysis and dissemination phases. AG and FU contributed to the analysis and revision of the manuscript.

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Factors Associated with Childhood Diarrhea in Rwanda: A Secondary Data Analysis of the Rwanda Demographic and Health Survey 2014-15

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Abstract

Background
Diarrheal diseases remain an important cause of morbidity among children, particularly in children under five years old, in low- and middle-income countries where it causes nearly 1.7 billion cases every year.
Methods
We used a quantitative cross-sectional design. This study aimed to explore the determinants of child diarrhea among under five-year children in Rwanda. A deep analysis of the 2014-2015 Rwanda Demographic and Health Survey (RDHS), with multivariate logistic regression, using stata13 was performed. The 2014-2015 Survey was the fifth standard national survey, implemented by the National Institute of Statistics of Rwanda (NISR) in a period of six months from November 2014 to April 2015.
Results
A sample of 2841 children under five years old were included. Chi-square test and logistic regression were performed. A significance level of 0.05 at 95% CI was considered. Child age and wealth index showed a strong association with diarrhea. Children in the age groups of 6-11, 12-23, 24-35 months were at higher risk of diarrhea than children aged 48-59 months, OR: 5.0 [3.1-8.2], P-value: 0.001; OR: 7.6, CI [4.7-12.2], P-value: 0.001; OR:3.8 [2.3-6.2], P-value: 0.001 respectively. Moreover, children from poorest and poorer families were twice more at risk of diarrhea than children from richest families. OR: 2, CI [1.3-2.9], P-value: 0.001.
Conclusion
The study concluded that low wealth index, and child age less than 35 months were important risks for under-five child diarrhea.
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Key words: determinants, under five years children, diarrhea

Introduction

Diarrhea is the loss of three or more loss of liquid stools per day, or more frequently than is normal for the individual.[1,2] Diarrhea is a high burden disease and accounts for nine percent of all deaths among children under five years old worldwide.[3] Diarrhea causes nearly 1.7 billion cases every year.[4] The global burden of diarrheal disease and deaths varies in developed and developing countries with half of all diarrheal deaths occurring in the African region.[5]. Children living in poor areas have higher case-fatality rates compared to children living in the developed world due to poor access to safe water, sanitation, hygiene, urgent medical care and effective hygiene and sanitation measures.[6–8] The prevalence and correlates for diarrhea vary with geographical area, and between countries.[9] Diarrheal diseases are associated with socioeconomic status, especially with mother's educational status. Poor environmental sanitation and hygiene, inadequate water supplies and poverty.[10]

The 2012 Declaration on scaling up treatment of diarrhea and pneumonia from donors, industry and non-governmental organizations (NGOs) called on all high burden countries and the international community to provide the resources, political will and focused action needed for ending preventable childhood pneumonia and diarrhea deaths.[11] In line with this declaration, Rwanda has made health sector reforms and reinforced specific programs such as expanded program of immunization, the fight against diseases including diarrhea, the integrated management of childhood illness, and the high impact interventions at the community level.[12]

Moreover, vaccine against rotavirus responsible for diarrhea has been introduced in Rwanda routine immunization program in 2012. Nevertheless the Rwandan Ministry of Health still lists diarrhea as the third (after malaria and pneumonia) among top ten causes of under five children morbidity with prevalence of 20 percent in 2014 in all health centers nationwide.[1] There is a paucity of information about the determinants of diarrhea in under-five years old children in Rwanda. This study intended to do a deep analysis of the RDHS data and find the determinants of childhood diarrhea, in Rwanda.

Methods

A cross-sectional study design with a deep analysis of the dataset from the Rwanda Demographic and Health Survey 2014-2015 was used. The 2014-2015 Survey was the fifth standard national survey, implemented by the National Institute of Statistics of Rwanda (NISR) in a period of six months from November 2014 to April 2015. The main objective of the 2014-15 RDHS was to obtain information on demographic and health indicators, including family planning; maternal mortality; infant and child mortality; nutrition status of mothers and children; antenatal care, delivery, and postnatal care; childhood diseases; and pediatric immunization. In addition, the survey measured indicators such as domestic violence, the prevalence of anemia and malaria among women and children, and the prevalence of HIV infection in Rwanda. A total of 12,793 households were selected and 12,699 completed the Household Questionnaire, yielding a response rate of 99.9 percent. In the 12,699 households surveyed, 13,564 women age 15-49 were identified as being eligible for the individual interview; interviews were completed with 13,497 of these women, yielding a response rate of 99.5 percent.[14]

In this study, we included a population of 2,841 children under five years old from the individual record file (IR). Bivariate analysis with Chi–square test was performed to assess the association factors Multivariate analysis was performed with logistic regression model to assess the relative effect of the risk factors on diarrhea.

Descriptive statistics were used to summarize the data. We used Chi-square test to evaluate the association between sociodemographic factors and child diarrhea. A significance level of 0.05 at 95% confidence interval was considered. The data was analyzed using Stata 13.
Logistic regression analysis was used to assess the determinants of under-five child diarrhea. For variables that showed association (P≤0.05) in bivariate analysis, useful variables that define diarrhea were subsequently identified

Ethical considerations

This study used a secondary data analysis of the RDHS 2014-2015.The Survey has been approved by the Rwanda National Ethics Committee (RNEC). The researchers have been authorized to download and use Survey data from the Archives of Demographic and Health Surveys (DHS) Program.

Results

Socio-demographic characteristics of respondents

More than a quarter 734 (25.8%) of all children included in the study were in the age group between 11-23 months and 247 (8.7%) were between 48 and 59 months. The study population had slightly more males than females. 1440 (50.7%) children were males while 1401 (49.3%) were females. Nearly three quarters (73.3%) of children's mothers were between 19 and 34 years. The largest proportion of children's mothers 72.1% (2049) had attained their primary education while 14.1% (402) had no formal education. A large proportion (83.3%) of participants resided in the rural area while 16.7% were in urban area. Socioeconomic status was classified into 5 categories where poorest and poor were 24% and 22% respectively (Table1).

Table1. Household socio-demographic characteristics of respondents

Variables	Number	Percentage (%)
Child age (in months)		
Mean age=24		
<6	349	12.3
6-11	429	15.1
11-23	734	25.8
24-35	623	21.9
36-47	459	16.2
48-59	247	8.7
Total	**2841**	**100**
Child sex		
Male	1,440	50.7
Female	1,401	49.3
Total	**2841**	**100**
Maternal age (in years)		
≤18	29	1.0
19-34	2082	73.3
≥35	730	25.7
Total	**2841**	**100**
Maternal education		
No education	402	14.1
Primary	2049	72.1
Secondary	324	11.4
Higher	66	2.3
Total	**2841**	**100**
Residence		
Urban	474	16.7
Rural	2,367	83.3
Total	**2841**	**100**
Employment		
Yes	2,451	86.4
No	387	13.7
Total	**2,839**	**100**
Wealth index		
Poorest	683	24.1
Poorer	628	22.1
Middle	554	19.5
Richer	485	17.1
Richest	491	17.3
Total	**2841**	100
Province		
Kigali city	328	11.7
Southern	669	23.8
Western	619	22.0
Northern	415	14.8
Eastern	781	27.8
Total	**2813**	**100**

Environmental characteristics of the households

Households using improved sources of water were 1940 (70.1%) as compared to (29.9%) who used non improved sources of water. The households with improved toilet facility represent 71%. Around two thirds (60.4%) of the households used above 15 minutes for a round trip to obtain water for domestic use, and 782 (27%) use to spend around 15 minutes or less. The majority (77.9%) of households were built with non-improved floor material like earth or sand (Table 2).

 https://dx.doi.org/10.4314/rjmhs.v2i3.4

Table 2. Environmental characteristics of the households

Variables	Frequency	Percentage
Source of water		
Improved	1940	70.1
Non improved	827	29.9
Total	**2766**	**100**
Toilet availability		
Available	2,120	78.2
Not available	593	21.9
Total	**2713**	**100**
Types of toilet facility		
Improved	1767	71.0
Non improved	721	29.0
Total	**2488**	**100**
Main floor material		
Improved	621	22.1
Non improved	2188	77.9
Total	**2809**	**100**

Bivariate analysis for associations with child diarrhea

Chi-square test was performed and variables including wealth index, child age and maternal education showed a statistically significant association with under five child diarrhea (P-value < 0.001). Household floor material also showed some association with diarrhea (P-value<0.05).

Table 3. Association of sociodemographic, and environmental factors with child diarrhea

Variables	Had diarrhea			
	Yes	No	Total	P-value
	n (%)	n (%)	n (%)	
Child age (in months)				
<6	23 (0.8)	325 (11.5)	349 (12.3)	
7-11	76 (2.7)	353 (12.4)	429 (15.1)	
12-23	181 (6.4)	553 (19.5)	734 (25.8)	**.001*** **
24-35	85 (3.0)	538 (19.0)	623 (21.9)	
36-47	29 (1.0)	430 (15.1)	459 (16.2)	
48-59	9 (0.3)	239 (8.4)	247 (8.7)	
Maternal age (in years)				
≤18	5 (0.2)	24 (0.8)	29 (1.0)	
19-34	300 (10.6)	1781(62.7)	2082 (73.3)	.673
≥35	97 (3.4)	633 (22.3)	730 (25.7)	
Child sex				
Male	216 (7.6)	1224 (43.1)	1440 (50.7)	.238
Female	187 (6.6)	1214 (42.7)	1401 (49.3)	
Family size				
<5	165 (5.8)	1057 (37.2)	1221 (43.0)	
5 to 7	189 (6.7)	1109 (39.1)	1299 (45.7)	.815
8 to 10	45 (1.6)	256 (9.0)	301 (10.6)	
≥11	3 (0.1)	16 (0.6)	20 (0.7)	
Wealth index				
Poorest	123 (4.3)	560 (19.7)	683 (24.0)	
Poorer	99 (3.5)	529 (18.6)	628 (22.1)	**.001*** **
Middle	72 (2.5)	482 (17.0)	554 (19.5)	
Richer	63 (2.2)	423 (14.9)	485 (17.1)	
Richest	46 (1.6)	445 (15.7)	491 (17.3)	
Residence				
Urban	60 (2.1)	414 (14.6)	474 (16.7)	.369
Rural	343 (12.1)	2025 (71.3)	2367 (83.3)	
Maternal education				
No formal education	74 (2.6)	324 (11.5)	398 (14.2)	
Primary	289 (10.2)	1740 (61.8)	2049 (72.1)	**.001*** **
Secondary and higher	35 (1.2)	351 (12.5)	66 (13.7)	
Household floor materials				
Non improved	330 (11.7)	1858 (66.2)	2188 (77.9)	**.014** **
Improved	65 (2.3)	556 (19.8)	621 (22.1)	
Shared toilet				
No	280 (10.3)	1840 (67.8)	2120 (78.1)	.229
Yes	90 (3.3)	503 (18.6)	593 (21.9)	

Logistic regressions to assess the risks for under five child diarrhea

In the final logistic regression model, age and wealth index showed a consistency of association with diarrhea. Children in the age groups of 12-23, 24-35, 6-11months were more likely to experience diarrhea than children aged 48-59 months, OR: 7.6, CI [4.7-12.2], P-value: 0.001; OR: 3.8 [2.3-6.2], P-value: 0.001; OR: 5.0 [3.1-8.2], P-value:0.001respectively. Children from poorest and poorer families were also more at risk of diarrhea than children from richest families. OR: 2, CI [1.3-2.9], P-value: 0.001.

Table 4. Multivariate analysis output

Variables	Full model		Reduced model	
Child age (in months)	**OR [95% CI]**	**p**	**OR [95% CI]**	**p**
48-59	1.0		1.0	
0-6	1.6 [0.8-3.0]	0.147	1.7 [0.9-3.1]	0.109
6-11	5.1 [3.1-8.3]	0.000***	5.0 [3.1-8.2]	0.000***
12-23	7.6 [4.7-12.3]	0.000***	7.6 [4.7-12.2]	0.000***
24-35	3.8 [2.3-6.2]	0.000***	3.8 [2.3-6.2]	0.000***
36-47	1.8 [1.1-3.0]	0.029**	1.8 [1.1-3.0]	0.029
Wealth index				
Richest	1.0		1.0	
Poorest	1.8 [1.1-3.2]	0.029**	2.0 [1.3-2.9]	0.001***
Poorer	1.8 [1.0-3.1]	0.046**	2.0 [1.3-3.0]	0.001***
Middle	1.3 [0.8-2.4]	0.316	1.4 [0.9-2.2]	0.133
Richer	1.3 [0.8-2.0]	0.350	1.3 [0.9-2.1]	0.183
Maternal education				
Tertiary	1.0			
No education	1.6 [1.0-2.6]	0.064		
Primary	1.4 [0.9-2.1]	0.161		
Household floor material				
Improved	1.0			
Non-improved	0.9 [0.6-1.5]	0.769		

Discussion

In this study, we used multivariate logistic regression analysis to assess the effect of variables including child age, wealth index, maternal education, and household floor material on childhood diarrhea. The findings revealed that child age is significantly associated with diarrhea (P-value<0.001). The risk of diarrhea increases with child age where 12-23 months were the pick age with a higher likelihood for diarrhea that than the age range of 48-59 months. Moreover, the risk was fivefold among children in the age range between six to eleven months. These findings are supported by some studies which concluded that children aged between six months to two years have high risk for diarrhea. The risk reduces as the child grows older.[15–17]. Younger child age exposure to diarrhea has been linked to underdeveloped immune system that is incapable of mounting an effective immunological response to the diseases. As the child grows older, the development of the immunity after repeated exposure reduces susceptibility to the diseases [18]. In addition, young children tend to ingest material while crawling. These materials may be contaminated and cause diarrhea illness.

This study also concluded that low socioeconomic status as indicated with the wealth index is associated with diarrhea. These findings are consistent with other studies from low-income countries, where children from poor families were at higher risk of diarrhea. Poorest and poorer families are less likely to have the financial resources to buy healthy or enough food.[19,20] The evidence generated from a systematic review of literature also revealed that young age of the child (usually <24 months), and low socioeconomic status are the risk factors of acute childhood diarrhea.[17]

Conclusion

Diarrhea is one of the top ten causes of child illness among under five years old children in Rwanda. This study therefore identified important determinants of under five children diarrhea and concludes that low socioeconomic status, and younger child age category are the potential determinants of under-five diarrhea.

Recommendations
Based on the study findings, efforts to strengthen families with under-five children should be undertaken to increase their social economic status and to ensure appropriate nutrition of their children.

Limitations of the study
The study focused on a population of children aged between 0-59 months. This population is believed to be at the highest risk of diarrhea. The study was limited by some factors related the nature of RDHS datasets. The role of hand washing in prevention of diarrhea has been highlighted in the literature. However, the RDHS did not collect data on hand washing practice.

Conflict of interest
The authors declare that there is no conflict of interest.

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Local authorities' Attitude Towards People with Mental Illness in Musanze District, Rwanda

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Abstract

Introduction

Mental illnesses (MIs) are currently contributing to the worldwide burden of disease and they are among 10 main causes of disability on worldwide. In addition, mental Health care users are among the people most stigmatized by the general population which includes local leaders.

Methods

The design used for conducting this study was quantitative and cross-sectional survey and the study was conducted in Muhoza sector of Musanze District in Rwanda. The tool used to correct data was self-report questionnaire that included socio-demographic variables (gender, age, experience and level of education), level of contact scale and community attitudes towards mental illness - Swedish version (CAMI-S). In this study self-report questionnaire was provided to the local authorities in Muhoza sector (n=123, N=174). Data analysis was done using a statistical package for social sciences (SPSS) version 22.

Results

Findings from the current study revealed negative stereotypical attitudes among local authorities towards people with mental illness. The participants' total score on the CAMI-S was ranging between 24% and 81%. In addition, the study revealed some contradictions and neutral responses. Less negative stereotypical attitudes were found among participants who have university and secondary education levels than participants with primary education and those who have not completed primary school. In addition, participants with more experience in local government system reflected less negative stereotypical attitudes than participants who are less experienced in local government system. This study showed a negative correlation between level of contact and community attitudes towards mental illness.

Conclusion

Local authorities in a selected sector of Musanze District, hold negative stereotypical attitudes towards people with mental disorders. However, the extent of contradiction within participant responses suggests social desirability bias. Also, there is association between negative stereotypical attitudes and the level of education and experience. Finally, the results suggest that familiarity has a mediating effect on negative stereotypical attitudes.

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Key words: Local authorities, mental illness, negative stereotypical attitudes, familiarity, sector

Introduction

Literature highlights characteristics of mental illness which include behavioural or psychological symptoms which could be associated with distress and disability or with an important loss of independence.[1] Mental illnesses and drug abuse are important causes of disability worldwide. The global prevalence of mental illnesses is estimated at 4% to 26% globally.[2]

,The prevalence will increase up to 23% in developed countries.[2,3] This issue of high prevalence of mental illness is stressed to be complicated by stigma and discrimination in regards to persons with a mental illness. Stigma towards persons with mental illness is considered as a barrier to help seeking, full recovery and rehabilitation for persons in need of mental health services.[4]

To improve the quality of care provided to persons with mental illness, the integration of mental health services in general health care facilities was recommended by the World Health Organization. Such integration is argued to contribute in reduction of mental health related problems which currently are considered as burden.[5] This integration has been considered by the Government of Rwanda due to the fact that genocide against Tutsi in1994 has had negative impact on the mental health of Rwandans.

The Rwandan Ministry of Health highlights enormous trauma related psychological and mental problems which affect negatively Rwandan mental health services.[6] To face mental health problems associated with the genocide, perpetrated against the Tutsis, the Ministry of Health in Rwanda started to integrate mental health from the community level up to referral level. Success of this integration at community level would rely on local authorities as long as they are coordinating all activities requested by the central government at the community setting including health related activities undertaken at community level.[7,8]

For such integration, the Rwandan Ministry of Health acknowledged nurses at all levels as health care team members with whom people mentally ill have the first contact.[9] However, there is scarcity of mental health professionals, especially nurses in primary care settings including the community level. This gap among health care professionals including mental health nurses at the community level is suggested to have been tackled by community health workers operating very closely with local authorities. Local authorities coordinate all community activities including health related activities as performed by community health workers who are argued to be involved in health care delivery essentially at community settings through coordination of health promotion and preventive interventions.[10,11]

Additionally, local authorities are mandated to protect all population from any kind of discrimination and exclusion which are eventually the outcome of stigmatizing attitude. In addition, local authorities are suggested to be close and to be in a good position to assist and doing advocacy of any vulnerable groups including persons with a mental illness within the community.[12] Therefore, local authorities have an important role to play for health care including mental health related services in the community settings. However, current literature suggest stereotyping attitudes towards people with mental illness amongst the general population composed of different categories of people including local authorities as well.[13–15]

At this time when the Rwandan Ministry of Health is integrating mental health services in general health care facilities, especially in the community level, it is argued to be challenged by potential negative stereotypical attitudes amongst local authorities. Also, this could constitute an important barrier to such integration as long as it recommended to start from the community level.
Local and international authors argue that integrated mental health care services from community to central level, will reduce stigmatizing attitudes towards mental illness.[7,16,17] With such integration, anti-stigma initiatives will take place and are suggested to reduce negative stereotypal attitudes in regards to mental illness. Current literature argues that both increased level of contact and knowledge about mental illness are positive mediators of negative stereotypical attitudes towards mental illness.[18,19]

This issue of stigma and anti-stigma initiatives concern health care system in Rwanda and mental health related activities to be integrated in general health care settings. However, there are no studies conducted on stigmatizing attitudes amongst local authorities towards mental health care users in Rwanda. This calls for conducting research in regards to stigmatising attitudes towards people with mental illness amongst different categories of the population in Rwanda. These categories of Rwandan may be directly or indirectly taking part in the integration of mental health services and the process of fight against mental health related stigma.

The aim of this study was to describe stereotypical attitudes among local authorities; and factors linked to negative stereotypical attitudes among local authorities towards persons with mental illnesses

Methods

Research design

This study was conducted using quantitative, descriptive design. A self-report questionnaire was used to collect data on the attitudes of local authorities with regard to mental illness.[20,21]

Study setting and participants

The study was conducted in Muhoza sector in Musanze District in Rwanda. Muhoza sector is composed of 4 cells that are under the responsibility of Executive secretaries and 26 villages under responsibility of and executive committee as led by the chief of village. Local authorities, who participated in this study, are composed of cell executive secretaries (4), cell council members with 10 members for each cell (4x10= 40 cells council members). Also, the study participants included village executive committees of Muhoza sector with 5 members for each village (5x26= 130 village executive committee members). Local authorities in Muhoza sector make a total number of 174.

Muhoza sector was conveniently sampled as it is close to the researcher's work place during his community outreach activities.[20] Villages, cells and local authorities were sampled to obtain sufficient numbers for statistical power in the data analysis that necessitated at least 100 participants.[22] The 174 local authorities operating under Muhoza sector, 123 local authorities were available and accepted to participate in this study that allowed achieving a response rate of 70.6%.

Instruments

Questionnaire was used to collect data from participants. This tool is composed of three sections: Social-demographic variables (age, gender, level of education), level of contact scale (LOC) and community attitudes towards persons with mental illness Swedish version (CAMI-S). In this study, participants' socio-demographic factors were considered as independent variables, while

LOC and CAMI-S were considered as dependant variables. This tool has been adopted from the original level of contact scale (LOC) as developed by Corrigan and his research team in 2001 and the original community attitude towards mental illness Swedish version as developed by Högberg and his colleagues in 2008 in Sweden.[23,24]

The familiarity (level of contact) as developed by Corrigan & his research group in 2001, is composed of 12 levels from "Never observed a person with mental illness" to "I have mental illness" and was considered as dependant variable.[23] The statement "I have mental illness" is the highest level of familiarity that any person may have in regards to mental illness.[23] The level of contact scale was developed to measure the extent of participants 'familiarity towards persons with mental illness. The tool was previously used by different researchers internationally and locally for example, in Europe by Morris and colleagues (2012), in Nigeria by James and the research team (2012), Adewayu and Maknjuola (2008) and in South Africa by Smith and Middleton (2010).[25–29] Holmes and Colleagues reported the LOC reliability of 0.83.[30]

The community attitude towards mental Illness Swedish version (CAMI-S), has three subscales that make a total of 20 items: open minded and pro-integration subscale (9 items); fear and avoidance subscale (6 items); and community mental health ideology subscale (5 items). The community attitude towards mental Illness Swedish version (CAMI-S) was reported by Högberg and his team to have reliability of 0.903 on the 20 items.[24] Both level of contact scale, and community attitude towards Mental Illness- Swedish version were in English and the translation was done from English to Kinyarwanda by translation expert person working in CMHS centre of language enhancement. The translation was done due to the fact that all local authorities do not have ability to express themselves in English, thus local language is highly recommended to be used.

Data collection process

Before starting the data collection, the researcher held a meeting with the executive secretary of Muhoza sector and it was aiming at agreement on the schedule of data collection according to the planned activities by sector, cells and villages.[20] The researcher collected data from available local authorities and information about the study was given to participants. The participants were found at Muhoza sector headquarters when they were invited for meetings. Regarding the participants who were not available at Muhoza Headquarters, the researcher connected telephonically with cell executive secretaries to facilitate meeting with them at cell headquarters. Participants were given time to ask questions prior to their participation. In addition, before participation, the researcher explained to the participants that participation was voluntary and anonymity was assured. At the end of completion of questionnaires, participants gave them back to the researcher and they were kept in closed envelops.

Data analysis

The statistical package for social sciences (SPSS) Version 22 was used to analyse data.[22] Regarding the LOC, the highest score from the level of contact was considered because participants were asked to tick on each item applicable to them. The lowest level of contact was scored by 1 and the highest by 10. To analyse items 4,5,6,10,11,12,13,17 and 20 on the CAMI –S, scores were reversed. The reverse scoring was performed on respective items because items were expressing negative attitudes towards persons with mental illness. The scale starts by less stigmatizing attitude to more stigmatizing attitude ((strongly agreeing with the statement (score=1) agreeing with the statement (score=2) neutral (score=3), disagreeing with the statement (score=4) and strongly disagreeing with the statement (score=5)). Items 1,2,3,7,8,9,14,15,16,18 and 19 were not reversed as long as they were positively expressed.

Analysis focused on measures of central tendency and distribution included the range (minimum and maximum), mode (most commonly occurring score), median (the middle score when the score is ranked from smallest to largest and sometimes known as the midpoint), skewness statistics and standard error of skewness statistics and quartiles. The data from items on the CAMI-S was grouped into subscales to compute percentages, proportions, means and standard deviation. Data was not normally distributed as confirmed by measures of central tendency and histograms of each item which revealed a skewed distribution and scores that are clustered to the left side of the distribution.[22] However, non-parametric tests were not used for further analysis due to the fact that the sample was two small (123 participants).[22]

An independent – samples t-test was used to compare the mean score of CAMI-S subscales and total score for males and females (association).[22] One way between groups analysis of variance (Post Hoc Tests) was conducted to test relationship between remaining independent (age, level of education and experience) variables and CAMI-S subscales and total score.[26] The associations were considered statistically significant when the significance level of Levine's tests is (P= or <0.05).[22] Lastly, correlations were tested by using the Spearman's rho correlation coefficient test. The correlation were tested between level of contact (LOC) and CAMI-S subscales and total score.[26] and it was considered statistically significant, if $p<.05$ [22]

Ethical considerations

Before starting the data collection, the ethical approval has been granted to the researcher from the CMHS institutional review board (No 020/CMHS/IRB/2016).[20] Also, a permission to conduct a research was given by the District of Musanze (No 0662/07.04.03) as an administrative structure which supervises all activities of Muhoza sector. The implied consent was used to reduce social desirability bias which is suggested to influence participants' responses.

In this study, implied consent was used to assure participants of anonymity and attempt to reduce responses that may represent social desirability. The implied consent was considered by the researcher as consent to participate in a study on certain actions of the participant, such as returning a completed questionnaire.[20,21] Local authorities as adult persons were not taken as vulnerable people. Thus this research was argued to be low risk research. There was no remuneration because it is suggested to influence participants' responses and in return biase results. Lastly, the research report was provided to the respective sector and dissemination is in process.[21]

Results

Study participants characteristics

Table 1shows that the total number of participants is 123 composed of females (n=45; 36.6%) and males (n=78; 63.4 %), while they are distributed into four classes regarding their age; class 1: 18-21 (n=47; 30.9%); class 2 :22-25 (n=41; 43.9%); class 3: 26-30 (n=23; 16.3%) and class 4: more than 30 (n=12; 8.9%). For the distribution of participants according to their level of education, the current study revealed that the majority of local leaders had completed primary school (n=47; 38.2%), followed by local leaders who had not completed primary school (n=41; 33.3%); while local leaders who completed high school (secondary school) were (n=23; 18.7%) and (n=12; 9.8%) have had contact with university studies. The majority of participants were in their first term/ mandate (n=43; 35.5%), while participants with three terms/mandates were (n=42; 34.1%) and participants with two terms/mandates were the last with (n=38; 30.9%).

Table 1. Distribution of participants according to their social-demographic variables

Sociodemographic variables	Frequency	Percentage
1. Sex of participants		
Female	45	36.6 %
Male	78	63.4%
Total	**123**	**100 %**
2. Age of participants (in years)		
18-21	47	30.9%
22-25	41	43.9 %
26-30	23	16.3 %
Plus 30	12	8.9%
Total	**123**	**100%**
3. Experience of participants (terms)		
First term	43	35.0 %
Second term	38	30.9 %
Third term	42	34.1%
Total	**123**	**100%**
4. Level of education of participants		
Primary school not completed	47	38.2%
Primary school completed	41	33.3%
High school/ Secondary school	23	18.7%
University education	12	9.8%
Total	**123**	**100%**

Results from the community attitudes towards mental illness Swedish version

The community attitudes towards mental illness Swedish version were analyzed using SPSS and percentages were computed to show the number of participants' responses on each Likert-scale and make a total of 100% for each statement.

As displayed in Table 2, the current study revealed that participants reflected negative stereotypical attitudes on all CAMI-S. These findings indicate that most prevalent negative stereotypical attitudes were on the items 2 & 7 whereby participants disagree that most persons who were once patients in a mental hospital can be trusted as babysitters (64.6%) for item 2 and that mental illness is an illness like any other (64.6%) for item 7. However, less negative stereotypical attitudes were found on the items 1 & 8 where participants are for integration of persons with a mental illness by agreeing that residents should accept the location of mental health facilities in their neighborhood to serve the needs of the local community (71.8%) for item 1 and that we need to adopt a far more tolerant attitude towards the mentally ill in our society (71.8%) for item 8. There is evidence of contradictions throughout different items on CAMI-S. For example, participants were of the idea that persons with a mental illness could be tolerated and at the same time they agree that mental illness is different from other diseases. This issue of contradictions goes together with neutral positions found on all items but frequently on the item 20 suggesting that people mentally ill should be isolated from the rest of the community (40.7%).

Table 2. Description of participants' responses to statements on the CAMI-S

Item statements	Participant responses					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
Subscale1: Open ended and pro- integration						
1. Residents should accept the location of mental health facilities in their neighbourhood to serve the needs of the local community	56(45.5%)	33(26.8%)	12(9.8%)	4(3.3%)	18(14.6%)	123 (100%)
2. Most persons who were once patients in a mental hospital can be trusted as babysitters	11(8.9%)	18 (14.6%)	24(19.5%)	30(24.4%)	40(32.5%)	123 (100%)
3. Locating mental health services in residential neighbourhoods does not endanger local residents	24(19.5%)	44(35.8%)	23(18.7%)	28(22.8%)	4(3.3%)	123 (100%)
4. Mental health facilities should be kept out of residential neighbourhoods	33(26.8%)	37(30.1%)	14(11.4%)	31(25.2%)	8(6.5%)	123 (100%)
5. Having mental patients living within residential neighbourhoods might be a good therapy, but the risks to the residents are too great	20(16.3%)	41(33.3%)	30(24.4%)	26(21.1%)	6(4.9%)	123 (100%)
6. Local residents have good reason to resist the location of mental health services in their neighbourhood	37(30.1%)	31(25.2%)	25(20.3%)	25(20.3%)	5(4.1%)	123 (100%)
7. Mental illness is an illness like any other	11(8.9%)	27(22.0%)	8(6.5%)	44(37.8%)	33(26.8%)	123 (100%)
8. We need to adopt a far more tolerant attitude towards the mentally ill in our society	55(44.7%)	34(27.6%)	11(8.9%)	13(10.6%)	10(8.1%)	123 (100%)
9. The mentally ill are far less of a danger than most persons suppose	27(22.0%)	51(41.5%)	16(13%)	26(21.1%)	3(2.4%)	123 (100%)
Subscale 2: Fear and avoidance						
10. It is best to avoid anyone who has mental problems	31(25.2%)	29(23.6%)	15(12.2%)	23(18.7%)	24(19.5%)	123 (100%)
11. I would not want to live next door to someone who has been mentally ill	34(27.6%)	30(24.4%)	19(15.4%)	29(23.6%)	11(13.0%)	123 (100%)
12. It is frightening to think of persons with mental problems living in residential neighbourhoods	19(15.4%)	45(36.6%)	9(7.3%)	34(27.6%)	16(13.0%)	123 (100%)
13. The best way to handle the mentally ill is to keep them behind locked doors	43(35.0%)	30(24.4%)	14(11.4%)	20(16.3%)	16(13.0%)	123 (100%)
14. Residents have nothing to fear from persons coming into their neighbourhood to obtain mental health services	34(27.6%)	41(33.3%)	19(15.4%)	23(18.7%)	6(4.9%)	123 (100%)
Subscale 3: Community mental health ideology						
15. Less emphasis should be placed on protecting the public from the mentally ill	28(22.8%)	36(29.3%)	27(22.0%)	22(17.9%)	10(8.1%)	123 (100%)
16. The best therapy for many mental patients is to be part of a normal community	37(30.1%)	44(35.8%)	13(10.6%)	17(13.8%)	12(9.8%)	123 (100%)
17. The mentally ill should not be treated as outcasts of society	54(43.9%)	33(26.8%)	13(10.6%)	8(6.5%)	15(12.2%)	123 (100%)
18. As far as possible, mental health services should be provided through community based facilities	45(36.6%)	34(27.6%)	17(13.8%)	17(13.8%)	10(8.1%)	123 (100%)
19. No one has the right to exclude the mentally ill from their neighbourhood	18(14.6%)	72(58.5%)	25(20.3%)	6(4.9%)	2(1.6%)	123 (100%)
20. The mentally ill should be isolated from the rest of the community	47(38.2%)	19(15.4%)	50(40.7%)	5(4.1%)	2(1.6%)	123 (100%)

Table 3 displays subscales and total scores achieved on the CAMI-S. Measures of central tendency (mean, standard deviation) and distribution indicated more negative attitude towards mental illness on subscale 2 "fear and avoidance" (*M*= 63.32; *SD*= 19.965) than subscale 1 "Open minded and pro integration" (*M*= 53.07; *SD*=15.240) and subscale 3 "Community mental health ideology" (*M*=37.23; *SD*=12.817).

Table 3. Distribution of subscales and total scores results achieved on community attitude towards mental illness Swedish version

		Open minded and pro integration	Fear and avoidance	Community mental health ideology	Total score
N	Valid	123	123	123	123
	Missing	0	0	0	0
Mean		53.07	63.32	37.23	50.90
Std. Deviation		15.240	19.965	12.817	13.521
Skewness		.232	.185	.558	.228
Minimum		22	24	17	24
Maximum		91	100	73	81

Significant associations between socio-demographic variables and CAMI- S subscales and total score

Table 4 displays the associations between socio-demographic variables and the CAMI-S subscales and total score and only significant associations are reported. However, prior to perform any statistical tests, percentages, proportions, mean and standard deviation on CAMI-S subscales and total score were computed. To compare the mean score of CAMI-S subscales and total score for males and females an independent – samples t-test was used.[22] The significant difference was considered when the significance level of Levine's tests was p=.05 or less. Findings from this study revealed no significant difference on CAMI-S subscales and total scores for female and male participants.

Also, a one-way between groups analysis of variance (Post Hoc Tests) was conducted to explore relationship between independent variables (age, experience and the level of education) and CAMI-S subscales and total score. [22] Comparison of mean scores of CAMI-S subscales for participant groups was computed. These participants groups include; age groups (group 1: 18-21 years; group 2: 22-25 years; group 3: 26-30 years and group 4: 31 years and above), participants' experience groups (group 1: one term, group 2: two terms, group 3: more than 2 terms) and participants level of education groups (group 1: not completed primary school, group 2: completed primary school, group 3: secondary school and group 4: university education). The statistical significance was considered if the P value is less than or equal to .05.[22]

The Post Hoc Tests found no statistical significance between age groups and score achieved on CAMI-S subscales and the total score. However, a statistically significant difference in CAMI-S subscales and total score for three participants experience (mandate or term) groups was found ((Open minded and pro integration (F=4.809; p=.003); fear and avoidance (F=4.479; p=.005); community mental health ideology (F=13.536; p=.000); total score (F=8.871; p=.000)). In addition, the statistically significant difference was confirmed by measures of central tendencies (mean and standard deviation as displayed in the Table 4.

The central tendency measures (mean and standard deviation) showed that participants experienced group (who have been elected more than 2 terms), recorded less scores than remaining participants groups (who are working their first and second terms) recording highest scores on the CAMI-S subscales and the total score. The findings indicate that the participants with more experience in local administration system reflected less negative stereotypical attitudes than participants who are less experienced in local administration.

Finally, the Post Hoc Tests revealed statistically significant difference between participants' group education level in regards to CAMI-S subscale 1Open minded and pro integration (F=6.019; p=.001) and the total score (F=5.720; p=.001) for four level of education participants groups. Also, the statistical difference was confirmed by measures of central tendencies (mean and standard deviation) as displayed in Table 4. The statistical difference suggested that participants with high level of education (university and secondary) recorded lower score on open minded and pro-integration subscale and the total score than participants with lower education (the group who did not completed primary education and the group that completed primary education) who recorded higher scores. This difference indicates that participants with high level of education reflected less negative stereotypical attitudes towards people with mental illness than participants with lower level of education.

Table 4. Significant associations between socio-demographic variables and community attitude towards mental illness subscales and the total score

		Open minded and pro integration	Fear and avoidance	Community mental health ideology	Total score
Associations					
Education					
Mean	No primary education	56.02	66.81	37.85	53.30
	Primary education	50.02	60.20	34.63	47.98
	Secondary education	59.30	69.74	42.35	56.83
	University	40.00	48.00	33.83	40.17
SD	No primary education	14.768	19.470	13.955	13.691
	Primary education	15.413	20.238	12.955	13.630
	Secondary education	13.656	17.091	10.870	10.434
	University	9.391	18.211	8.178	9.750
F		6.019	4.280	2.161	5.720
p		.001	.007	.097	.001
Experience					
Mean	1 term/mandate	56.81	69.33	44.25	56.19
	2 terms/ mandates	53.19	62.21	36.17	50.36
	3 terms/ mandates and more	49.58	59.20	36.17	50.36
SD	1 term/ mandate	17.903	19.759	13.580	14.764
	2 terms/ mandates	14.981	21.310	13.578	13.857
	3 terms/ mandates and more	12.199	17.569	7.591	10.302
F		4.809	4.479	13.536	8.571
p		.003	.005	.000	.000

Correlation between the level of contact and community attitudes towards mental illness

As described in the section of instruments, the level of contact scale ranges between a score of 1 "*Never observed a person with mental illness"* and a score of 12, "*I have a mental illness*".[23] In this study, the findings revealed that the level of contact score was ranged between score of 1 "*Observed a person with mental illness in passing* (0.6%, n=1) and score of 12, *I have a mental illness* (7%, n=11). The common occurring score was level 8, providing services or assistance to persons with mental illness (n=22; 17.9%) while the less commonly occurring score was level 2, Observed in passing a person with mental illness (n=1; 0.8%). However, no one among participants responded to ever have observed a person mental illness (n=0; 0%). To measure the level of contact, participants were asked to tick on each statement where it was applicable and the highest level was considered by the researcher.

A Spearman's rho correlation coefficient was performed for testing correlation between the participants level of contact and score achieved on the community attitude towards mental illness- Swedish version, subscales (subscale 1; open minded and pro integration, subscale 2; fear and avoidance and subscale 3; community mental health ideology); and the total score.[22] Statistical significance was considered if $p<.05$ and only significant correlation is reported.[22] The spearman's rho correlation coefficient revealed negative correlation (rho=-.498; p=.000) between participants level of contact and subscale 1 (open minded and pro-integration). Also, negative correlation (rho=-.339; p=.000) was found between the level of contact and the subscale 2 (fear and avoidance); between the level of contact and the subscale 3 (community mental health ideology (rho=-.430; p=.000)) and the total score (rho=-.522; p=.000). The negative correlation indicates that increase in level of contact correlates with a decrease in score achieved on the CAMI-S subscales (open minded and pro-integration, fear and avoidance and community mental health ideology) and the total score.

Discussion

The current study revealed negative stereotypical attitudes among local authorities towards people with mental illness. This study revealed similar findings from studies conducted internationally like European countries in 2012 by Morris and colleagues who found stigmatizing attitudes among students and Rosemberg in United Kingdom- London in 2018, who found stigmatising attitudes towards persons with mental illness among general population.[29,31] Bennett and

colleagues in Jamaica (2015) conducted a study that revealed negative stereotypical attitudes among nursing students towards persons with mental illness and in Poland, Kopera and his research team conducted a study that revealed negative stereotypical attitudes among both mental health professionals and students in 2015.[32,33] Also, findings from the current studies are in line with local studies conducted in Africa that revealed negative stereotypical attitudes among research participants towards persons with a mental illness. For example, a study conducted by Kapungwe and colleagues in Zambia revealed negative stereotypical attitudes among primary health care providers towards persons with a mental illness, while Barke and his colleagues in Ghana found stigmatizing attitudes among the population in regards to mental illness.[14,16]

However, participants agree with the idea of placement of mental health care services within the communities while they expressed a need of social distance with persons mentally ill. This was evidenced by several contradictions and neutral positions used to be taken by research participants.

In addition to these contradictions, the findings of the current study revealed neutral positions that are argued to be the result of social desirability bias.[33,34] Here, participants seem to agree with the declaration of United Nations (UN) about human rights and this issue of human rights has been taken into consideration in the costitution of different countries. The Rwandan constitution stipulates that all Rwandese are equal and must be given equal opportunities and be protected from any kind of exclusion or segregation.[12,35]

The current study revealed an association between the experience of participants in regards to local administration system (in regards to numbers of terms/ mandate) and the level of education and scores achieved on the CAMI-S subscales and the total score. These findings are in line with findings from the studies conducted by Barke and colleagues in Ghana (2011) among the general public and Song and colleagues in Taiwan (2005) among general public which revealed an association between the level of education and negative attitudes towards people mentally ill.[14,36] In addition, a study conducted in western Nigerian in 2008 by Adewaya and Oguntande found an association between experience and attitude towards people mentally ill.[27] Bjorkman and colleagues (2008) in Sweden, found an association between experience and stigmatizing attitude towards persons with mental illness among nursing staff. [37]

However, the current study revealed no significant association between sex and age of participants and the scores achieved on the CAMI-S subscales and the total score. This is consistent with a study conducted among mental health professionals and medical students by Kopera and colleagues in Poland suggesting no significant difference between females and males.[33]

Finally, participants in the current study reported a high level of contact with persons with mental disorders. The study results revealed a negative correlation between familiarity and negative stereotypical attitudes suggesting a mediating relationship between familiarity with persons with mental illness. In other words, decreased negative stereotypes were associated with increased familiarity.

These results are consistent with findings reported in literature from studies carried out on both the general population and health care professionals, suggesting a significant negative correlation between familiarity and stigmatizing attitudes.[23,29,30] These authors suggest that individuals who have a relative or a friend with a mental illness do not generally perceive mentally ill persons as being dangerous and therefore desire less social distance from them.

The study conducted by Adewayu and Maknjuola (2008) on social distance towards people with mental illness in South Western Nigeria suggested that high social distance towards people with mental illness correlates with having never cared for someone who is mentally ill. However, findings from this study contrast with other previous studies that have been conducted in Africa. For example, the study conducted by Smith and Middleton (2010), in South Africa, included a representative sample of potential employers who had high levels of intimate contact with persons with serious mental illnesses, and reported evidence of no relationship between familiarity and the extent of negative stereotyping or desire for social distance.[28] Also, findings from a study conducted by James and colleagues (2012) in Southern Nigeria on stigmatizing attitudes held by medical students and interns towards persons with mental illnesses suggested no significant correlation between familiarity with mental illness and stigmatizing attitudes.[26]

Conclusion

The current study revealed negative stereotypical attitudes among local authorities in regards to persons with mental illness in Muhoza sector. Also, findings from this study showed important contradictions and neutral responses. This study revealed significant association between participants experience and level of education and CAMI-S subscales (open minded and pro-integration, fear and avoidance and community mental health ideology subscales) and total scores. Finally, results from this study showed that participants' level of contact correlates with CAMI-S subscales (open minded and pro-integration, fear and avoidance and community mental health ideology subscales) and the total scores.
To clarify contradictions and neutral position found

among local authorities, more studies especially interventional research, are recommended to be extended to the whole country. These studies are aiming at providing national empirical data on attitudes towards people mentally ill and will analyse deeply the effectiveness of familiarity with people mentally ill in the process of reducing the negative stereotypical attitudes associated with mental illnesses.

To reduce negative stereotypical attitudes among local authorities' different activities happening at the villages could help to increase their level of knowledge in regards to mental health. These activities might include discussions or public talks about mental illness and can be organized at village level whereby all categories of people living in the village could benefit from them. Also, mental illness could be recommended among topics which are taught during the local leaders gathering commonly called ITORERO to improve knowledge in regards to mental illness.

Persons with mental illness could provide testimonies to increase the familiarity towards mental illness among local authorities and the general population that will reduce the negative stereotypes towards people mentally ill.

Two limitations for the current study are to be mentioned and these include the impossibility to generalize findings to all local authorities in the district or in Rwanda because the study was conducted in one selected sector. Also, the presence of the researcher on the research setting during the data collection would have been affecting the participants' responses.[20] In addition, the researcher used implied consent by submission of questionnaire, instead of informed consent. This was to reduce possible discomfort among participants and show evidence of voluntary participation and for reducing social desirability bias.[21]

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Conflict of interest
The authors declare that there is no competing interest

Contribution of authors
VB was involved in conceptual design, empirical analysis and dissemination phases. While AG and FU participated in data analysis and manuscript revision.

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Kangaroo Mother Care in the Community: Practices in Southern Rwanda

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Abstract

Background
The World Health Organization (WHO) guidelines recommend practicing KMC (Kangaroo Mother Care) continuously for weeks after discharge of preterm newborns. However, little is known about KMC practices in the community in Rwanda and other African countries.Therefore, this study sought to assess KMC practices in Southern Rwanda, primarily after hospitalization and identify barriers to KMC in the community.
Methods
A cross-sectional study was performed with data collected through a survey among 124 caregivers of preterm infants and Community Health Workers. The Statistical Package for the Social Sciences SPSS version 22 was used to analyze the data.
Results
Among all caregivers interviewed, 86.7% confirmed that they practiced KMC, both in the hospital (KABUTARE District Hospital) as well as after discharge, but there is a large variation in practice time and place. KMC is practiced more during daytime. Working in the fields and lack of support to the caregivers are reported most frequently as barriers to practice KMC in the community.
Conclusion
KMC-practice is still sub-optimal in Rwanda. Special attention should be directed towards KMC-practice at night and towards the reported obstacles of practicing KMC in the community, e.g. working in the field, lack of support and equipment, difficulties to sleep and health problems.
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Keywords: Kangaroo Mother Care - Follow-up - Preterm infants – Rwanda.

Introduction

WHO defines preterm birth as "babies born alive before 37 weeks of pregnancy or 259 days of gestation".[1] According to Gates B et al., 15 million babies are born prematurely every year worldwide. Over 60% occurs in Africa and South Asia.[2]Blencowe H, et al. reported that prematurity is the leading cause of newborn deaths and the second-leading cause of death in children under the age of five, after pneumonia.

In low-income countries, gestational age is often not registered. In that case, LBW tends to be used as a proxy for preterm birth, because preterm births often result in low birth weight (LBW). WHO defines LBW as "weight at birth of less than 2,500 grams".[2]

Beck et al. state that the morbidity associated with preterm births often extends to later life, resulting in enormous physical, psychological and economic costs. [3] Thus, interventions that reduce infant mortality and morbidity and the resulting economic costs related to it would be an important advance in health care.
According to Charpak et *al.* a feasible, cost-effective solution can be found in Kangaroo Mother Care (KMC). The method has been reviewed and adjusted, resulting in a new model consisting of three main components: position, feeding and follow-up policies. The position demands a continuous skin-to-skin contact between adult and infant, the latter only wearing a diaper, socks and a cap. Furthermore, the newborn must be held in a vertical position until he can regulate his own temperature. When possible, the child must exclusively be breastfed. Fortification (supplements) is allowed if there is a poor weight gain(<15g/kg per day).[4]

Akhtar et al. state that KMC provides an alternative to incubator care, without separation from the mother.[5] As stated by Conde-Agudelo and Bergh et al., it is proven to reduce mortality, severe infections, hypothermia and length of hospital stay and to increase weight gain and breastfeeding. However, the implementation

of KMC is often varied.[6,7] According to the World Bank this kind of care is especially recommended in low-income and lower middle-income countries, respectively characterized by an economy with a Gross National Income (GNI) per capita of $1,045 or less, and economies with a GNI per capita of $1,046 to $4,125.[8] Once the baby is medically stable and the caregiver is familiar with the KMC-method and in control of the breathing-sucking-swallowing coordination, the infant can be discharged. However, this assumes that an appropriate follow-up system is in place and that the caregiver of the preterm infant is willing to collaborate with this program. If this is not sufficiently practiced, the infant runs elevated risks of morbidity, malnutrition, development delays and even death. WHO recommends that KMC is practiced continuously until the baby weights 2,500 g. or until 40 weeks after gestation. Most preterm babies gain between 15 and 30 grams a day.[9] It means that KMC should be practiced at least three to four weeks (day and night) after hospital discharge when the baby is discharged at 2.000 g. or less. In some countries, such as Rwanda, LBW babies are often discharged at, or even before reaching, 2,000 g.

Methods

Study design

We utilized a cross-sectional study design to assess KMC, among LBW infants who received neonatal care at KABUTARE District Hospital (DH) in Southern Rwanda. The study also included the infants' caregivers.

Study site

The study was conducted in KABUTARE DH, where a neonatal medium-care unit was introduced in August 2010. Since January 2011, mothers of preterm newborns are offered the opportunity to get used to the KMC-method by staying for one or more days in a well-equipped KMC-ward. Once the infant weighs 2,000 grams, mother and child can be discharged. However, if the mother has a lot of work or has other children at home to take care of, discharge can be arranged if the infant weighs at least 1,800 grams.

KMC was first introduced in Rwanda in 2008 by the WHO. This article reports on KMC-practices in KABUTARE DH and after discharge from that hospital, with emphasis on KMC after discharge.

Follow-up

Once the mother (or caregiver) returns home, the Community Health Workers (CHWs) make a follow-up. For the preterm/LBW infants, CHWs are supposed to visit these families at home three times during the first four weeks, of which two times during the first week. These CHWs are best placed to observe KMC-practices after hospital discharge and it was for this reason that they were involved in the study.

Study population

The inclusion criteria for the study were: (A) low birth-weight infant (< 2,500 gram), (B) born between 01/01/2011 and 31/12/2012, (C) received neonatal care in KABUTARE DH, (D) discharged from that hospital alive, (E) discharged directly to the home of the caregiver (mostly the mother).

For each child included in the study that could be reached, both the caregiver and the CHW, who is responsible for maternal and child health in the village of the child's family, were interviewed.

Infants who were transferred to the University Teaching Hospital of BUTARE (CHUB) to receive neonatal intensive care were excluded.

Sample size

The original database consisted of 185 LBW children. Of these, 30 children died after they were discharged to home from KABUTARE DH. Thirty-one families could not be reached, either because they moved outside the area or because the address (village) in the hospital files was incomplete or incorrect. The remaining 124 children were visited at their homes.

The 124 mothers or caregivers of these children as well as their 124 respective CHWs were interviewed. Participation was voluntary and all participating mothers and CHWs signed the informed consent form.

Data collection procedure

This study was conducted between 2014 and 2015.The data were collected through a quantitative survey with some open-ended questions. A survey questionnaire was developed in English by the principal investigator and approved by the Research Committee within the Faculty of Public Health and Human Nutrition, Catholic University of Rwanda. The questionnaire was divided into three sections. Section 1: Background information on child and household. Section 2: Background information about the interview, such as address and date of the interview. Section 3: Information from the caregiver and the CHW who knows the family best.

The questionnaire was then translated in the local language, Kinyarwanda. The interviews were conducted with the mother of each selected child. The interview was done in two parts. The first part was addressed towards the caregiver and the second part towards the Community Health Worker.

Statistical analysis

The analysis of the data was performed through SPSS Version 22. Each variable was thoroughly checked by running the frequencies. All the answers of the open ended questions were given a code. We conducted a descriptive analysis of all the answers (frequencies of each code).

Ethical considerations

This study was approved by the Rwanda National Ethics Committee. All the interviews were conducted after signing an informed consent form. In order to treat the gathered data anonymously, no name or address of the respondents, nor of any institution, was shared with any other person than the researcher for data compilation. Authorization was also requested and granted from the local authorities, Kabutare DH, the Health Centers (HCs) and the head of the Community Health Workers of each sector.

Results

KMC practice in the hospital

The findings show that 82.3% respondents received information about the KMC method in the hospital. The majority received the information between 12 hours and 1 day after delivery (21%) or between 3 and 7 days (21%). Others received it between 1 and 12 hours after delivery (18%), between 1 and 3 days (14%), less than 1 hour (10%). There was a large variation in the timing of receiving this information, going from less than one hour after delivery (10%) to more than two weeks after delivery (9%)(figure 1).

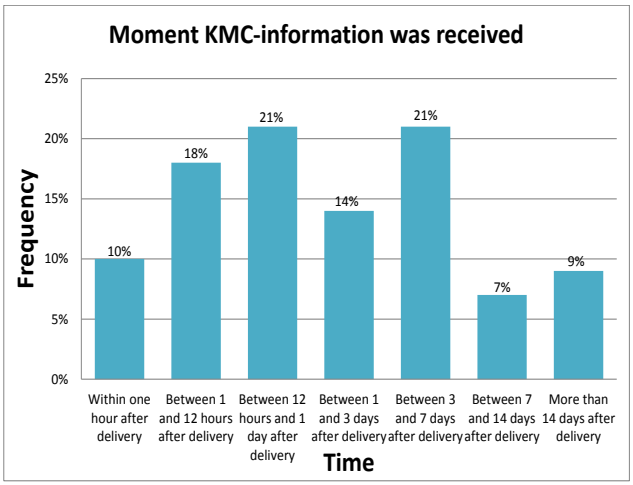

Figure 1. Moment KMC information was received (N=100)

The large majority of the interviewe (91.1%) confirmed that the KMC-practice started in the hospital. In six cases, it was not the mother who practiced KMC in the hospital.

There was also a large variation in the time that the persons concerned started using KMC in the hospital. Some already started within one hour after delivery (18.6 %), while a small number (7.1 %) started only one month after delivery (see Table 1).

Table 1. Moment that KMC started in the hospital (N=113)

Variable	n (%)	Cumulative %
Within one hour after delivery	21 (18.6)	18.6
Between 1 and 12 hours after delivery	19 (16.8)	35.4
>12 hours and <one day after delivery	15 (13.3)	48.7
Between 1 and 3 days after delivery	17 (15.0)	63.7
Between 4 and 7 days after delivery	20 (17.7)	81.4
Between 8 and 31 days after delivery	13 (11.5)	92.9
> One month after delivery	8 (7.1)	100.0

Not all women who delivered, started KMC in the hospital. In fact, 8.9 %of them did not start KMC in the hospital. Of those who did start KMC in the hospital, 85% stayed at least one day in the KMC-room. Of those who stayed in the KMC-room, 32.3 % left the room within one week, while 27.1 % stayed there one month or more.

KMC practice in the community

Starting KMC in the hospital is the best predictor for practicing KMC in the community. In fact, no one started KMC after hospital discharge, while only 5.3% of the main respondents, who reported that they started KMC in the hospital, did not continue KMC after hospital discharge. In total, 86.7% of interviewed persons who practiced KMC in the hospital reported to have continued KMC at least one day in the community (= after discharge). Of them, 83.7 % did so during at least one night. So, there is some difference between the KMC-practice during daytime and at night.

Of those who practiced KMC in the community during daytime, 8.2 % practiced it up to one week, 49 % practiced it between one week and four weeks, while 42.8 % practiced KMC more than 4 weeks.

Of those who practiced KMC in the community during daytime, 42.7 % did so only 1 to 3 hours per day, while 27 % did so for more than 6 hours per day.

Of those who practiced KMC at home during the night, all but two gave the duration that they continued doing so. Among those, 23.8 % stopped before the end of the first week, while 28.7 % continued during one month or more.

Of those who continued KMC at night, almost half did so only one to three hours per night, while about 1/4 did so the whole night (more than nine hours a night).

Figure 2 indicates who faced some obstacles during KMC practice. In fact, among 100 caregivers practicing KMC, 72% of them indicated that they did experience obstacles.

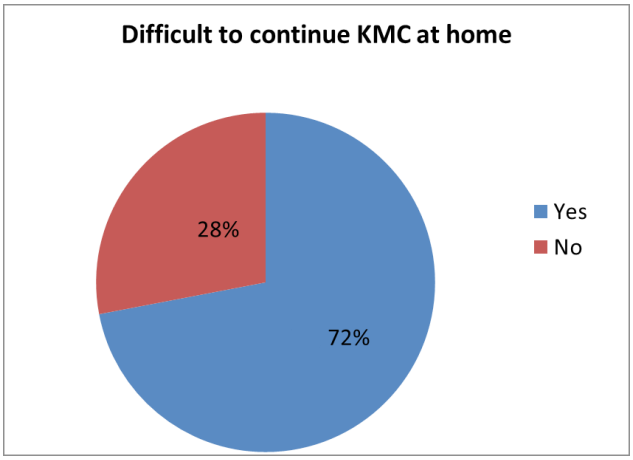

Figure 2. Difficult to use KMC at home (N = 100)

Table 2 gives more clarification of why KMC is not practiced more frequently in the community (80.6% of main respondents answered this question).
Each respondent could give one or more obstacles/ difficulties. Of those who did mention at least one barrier/obstacle, about 71 %, mentioned that it is difficult to work when practicing KMC (most of them specified 'working in the fields'), almost 53 % mentioned that it is difficult to get food, 43 % mentioned lack of equipment, and one fourth mentioned health problems (see table 2 for a complete overview of barriers). The frequency can also be expressed in percentage of all caregivers interviewed. 'Difficult to work' was mentioned by 41 % of all caregivers, 'difficult getting food' was mentioned by 30.6 % and 'lack of equipment' by 25 % of all main respondents. Among main respondents, 11.3 % reported 'having twins' as a barrier. Of those, 85.7 % had both twins alive at the moment of the interview. Two other mothers with both twins alive did not report this as a barrier. Fourteen mothers have lost one of both twins before the interview took place. Only one of them reported that having twins was a barrier for practicing KMC. In one case the barrier 'twins' was mentioned by a mother with a singleton child in the sample.

Table 2. Obstacles in practicing KMC reported by the caregivers (N= 72)

Variable	n (%)
Difficult to work (in the fields) with KMC	51 (70.8)
Difficult getting food	38 (52.8)
Lack of equipment such as warm clothes, a mattress, and sheets.	31 (43.1)
Health problems such as HIV, back pain and other sicknesses.	18 (25.0)
Having twins	14 (19.4)
Difficulties to carry the baby on the chest	10 (13.9)
Difficulty to sleep	9 (12.5)
Disagreements with the partner	8 (11.1)
Having a disability	2 (2.8)

Note: *Several caregivers mentioned more than one obstacle. N gives the number of caregivers who mentioned the specified types of obstacles.*

Improving KMC-practice in the community
Both the main respondents and the CHWs were asked to give some suggestions about how the practice of KMC in the community can be improved. In both cases, each respondent could give more than one suggestion. The answers are quite different, so they are reported in two tables. Table 3 presents the different suggestions made by the caregivers.

Table 3 indicates that most of the caregivers suggest that they should get more support. This includes more support in the provision of food, health insurance, equipment to carry the baby and to keep the baby warm, as well as to give birth in health facilities rather than at home. A second set of suggestions refers to the responsibilities of the mothers/caregivers. According to some caregivers, they should follow the instructions of the CHWs better, have more patience, make more time for feeding and caring for the baby and avoid activities that make it difficult to practice KMC. A third set of suggestions refers to responsibilities of healthcare personnel (visit the mothers at home, inform the families more).

Table 3. Suggestions that can improve future KMC practice in the community, as reported by the caregivers (N=124)

Variable	n (%)
Caregivers need more support in the provision of food	30 (24.2)
Caregivers and family members need to be better informed	26 (21.0)
Caregivers need more support in the provision of insurance	24 (19.4)
Caregivers need more support in the provision of equipment to keep warm.	21 (16.9)
Caregivers should spend more time taking care of the baby	18 (14.5)
Caregivers need to better follow the instructions given by the CHW	14 (11.3)
Caregivers need more support in the provision of modern carrying pouches.	9 (7.3)
Caregivers need to better feed the baby	7 (5.6)
Healthcare staff should visit the mothers at home	6 (4.8)
Mothers need to be encouraged to give birth at a health facility	4 (3.2)
The caregivers need to have more patience	2 (1.6)
Caregivers should not do difficult activities	2 (1.6)

The suggestions made by the interviewed CHWs to improve future KMC practice in the community are shown in table 4. The CHWs suggest several items that were not mentioned by the caregivers, while they did not suggest items mentioned by the caregivers. Only support in accessing food and need to explain the benefits of KMC was suggested frequently by both types of respondents. Several CHWs also referred to the importance of involving others, including health centers, to support KMC and to care for LBW infants after discharge from the hospital. Some CHWs stressed the importance of hygiene for the mother and of practicing KMC during the night (see table 4).

Table 4. Suggestions that can improve future KMC practice in the community, as reported by the CHWs (N=124)

Variable	n (%)
Support vulnerable caregivers in the access to food during KMC	42 (33.9)
Keep explaining the benefits of KMC to caregivers and family	30 (24.2)
Provide equipment for the caregivers such as sheets, a mattress, and warm clothes.	27 (21.8)
Keep the baby in warm conditions using a hat and socks	18 (14.5)
Ask and advice others to support the caregivers during KMC	15 (12.1)
Provide health insurance for mothers using KMC	14 (11.3)
Provide modern carrying pouches	13 (10.5)
Provide more training for the CHWs	12 (9.7)
Empower HCs to care for LBW infants at their level	10 (8.1)
Caregivers need to take care of their hygiene	9 (7.3)
Bring the child to check-up	8 (6.4)
Get help when the child has some problems	4 (3.2)
Practice it more at night	3 (2.4)

Discussion

There is hardly any information published about the practice of KMC after hospital discharge of LBW babies in sub Saharan countries. This study revealed that some caregivers did not continue KMC after discharge. Only 86.7 % did so for at least one day, only 73 % did so at least one night. Also, the average number of days and nights that they practiced KMC were likely to be suboptimal in most cases. One study from Nguah et al. reported that in Ghana 95.5% of the mothers planned to continue KMC after hospital discharge during the day and 93.1% were willing to practice it during the night.[10] The same study indicated that 61.9% of 202 mothers in Ghana thought KMC was easy to practice in the community. [10] The results of this study show that only 22.6 % of all caregivers experienced no difficulties in the practice

of KMC after hospital discharge. It would be interesting to analyze why the results differ in both countries and to conduct similar studies in other sub Saharan countries.

This study also focused on the barriers for practicing KMC in the community. The most frequently reported barrier is the difficulty to work (in the fields) while simultaneously practicing KMC (70.8 % of those caregivers that reported KMC barriers). According to several published studies, the interference of KMC in the mother's daily work schedule is a frequently reported barrier.[4,11–13] It is noteceable that this study was conducted in a rural area of Rwanda. This is also visible through the reported profession, 89.5% said to be farmer, cultivator or planter. Rural women may choose to stop or interrupt the KMC practice as it is common practice in the sub-Saharan region to work in the fields with the baby on the back. Bergh and Bazzano et *al.* also reported this tradition in studies conducted in Ghana, Malawi, Mali and Uganda.[7,11]

This study also focused on suggestions that may improve the use of KMC in the community. There are clear differences between the caregivers and the CHWs concerning the different types of suggestions and their frequencies. Both groups often mentioned supporting caregivers in provision of food, explaining to the family the benefits of KMC, and providing equipment to keep the baby warm. Caregivers often mentioned that they can do better in caring for the baby, while CHWs also suggested that the CHWs and the HCs need more training to care for LBW infants at their level. Several CHWs also reminded about the importance of using hat and socks by the babies and taking care of the hygiene of the caregivers.

Some barriers and suggestions are comparable to what is reported in other published studies. According to Bergh et al. it is beneficial to have support from the partner during KMC.[14,15] This study reports that 11 % of the 72 caregivers see 'disagreement with their partner concerning KMC' as one of the barriers.

The findings in this study show that difficulties to sleep were reported by 12.5 % of the caregivers as a challenge for practicing KMC at night. It has also been shown by Charpak & Ruiz-Pelaez that this should be one of the main concerns before starting KMC.[4] The same authors also mentioned that mothers experience difficulty to take care of their own hygiene.[4] The same issue was reported by 7.3 % of the CHWs in this study as an issue to be dealt with in order to improve the practice of KMC. However, the caregivers in this study did not mention it as a barrier in relation to KMC practice. Education about basic hygiene could help dealing with this issue.

There were a few limitations to this study. A first limitation is memory bias due to the time between the date of birth of the child and the time when the interviews were conducted. All children were born between January 1st 2011 and December 31st 2012, however the interviews only started in June 2014. As a result, the received information could be less accurate than when the interviews would have been conducted in an earlier period of time.

Not all caregivers were present in the hospital at the time the child received neonatal care. This may explain 'missing values' for some answers of the questionnaire. Lastly, a large majority of caregivers were living in the district of Huye. The other caregivers interviewed were living in two neighboring districts. The results are, therefore, not necessarily representative for Rwanda as a whole.

Conclusions and recommendations

This study sought some answers to three research questions: "To what extent and how long has the KMC method been applied in the hospital and after discharge?", "What barriers have been identified concerning the practice of KMC in the community?" and "What suggestions can be proposed to improve future KMC practice in the community?"

KMC started in January 2011 in Kabutare distric hospital. Since then, a large majority of LBW newborns who receive neonatal care in that hospital also receive KMC during their hospital stay and after they are discharged to go home. However, the responses of 124 caregivers showed that there is a large variation in the timing at which they received information about KMC, the number of days that the caregivers stayed in the KMC room, the number of days and nights that KMC was practiced in the community, as well as the number of hours per day and per night.

The results of this study indicate clearly that KMC practice is not yet optimal, especially after hospital discharge. Some caregivers stopped KMC too early to be sufficiently beneficial or did not even start KMC during the night. Only a minority practiced KMC continuously, day and night. Therefore, it can be recommended that all health care providers would scale up their efforts to provide information (concerning the benefits of KMC and how to practice it) continuously to all mothers giving birth to LBW children, as well as their partners. Special attention should be directed towards KMC practice at night as KMC appears to be less commonly practiced then.

Many respondents reported difficulties to practice KMC in the community. The answers suggest that several difficulties can be overcome by providing more support to the caregivers in getting food, health insurance, and material that help them to practice KMC. As "working

in the fields" is the most frequently mentioned obstacle to practice KMC in rural areas, specific strategies have to be worked out to deal with this obstacle.

It is recommended that the CHW-coordinators of the health centers would supervise the CHWs more closely and give the necessary training to be sure that they are all aware of the importance of more frequent home visits for preterm infants, and of continuing these visits for a longer period after birth. This also requires that the health centers are well informed by the hospital immediately after each discharge of a preterm neonate.
This study is limited to the experience in a few districts in the South of Rwanda, the large majority living in one district (Huye). As it is the first in Rwanda and surrounding countries, it brings important new information about the post-neonatal care to LBW-infants. Preferably, this study should be repeated in other districts and other sub-Saharan countries on a larger scale and at different times after the children are discharged from the hospital (six months, one year, etc...) to collect additional evidence to support policy-makers, health care providers and health service researchers.

Limitation of the study
It should be pointed out that this research did not attempt to analyze the real causes of suboptimal use of KMC in the community

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
LNN coordinated the field work and data analysis.
AMK provided guidance for the medical and KMC-practice aspects of the project.
LC supervised the research project

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Occupational Health Risks Associated with Medical Waste Management Practices among Health Professionals Working in Three District Hospitals in Rwanda

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Abstract

Background
Proper healthcare waste management is crucial to minimize the exposure of health professionals, patients, and the public in general, and to reduce the pollution of the environment in particular. In Rwanda, scientific documents on occupational health risks resulting from medical waste management practices among healthcare workers are currently rare.
Aim
This study aimed to explore occupational health risks associated with medical waste management practices among health professionals in the Rwandan context.
Method
A cross-sectional study design was used. The study used both quantitative and qualitative methods. The respondents were composed of health professionals (medical doctors, nurses, and paramedical staff) from the district hospital and six key informants. We used questionnaire, interview guide, and observation checklists as research instruments. We performed descriptive statistics to analyze the quantitative data. Also, qualitative data were analyzed using narrative analysis method.
Results
The findings revealed that 56.5 % of respondents from Kibagabaga hospital, 26.8% from Masaka and 49.3% from Muhima Hospital reported that they experienced occupational health risks related to inadequate medical waste management at their workplaces, and some of those risks include risk of infection and physical injuries.
Conclusion
This study concludes that health professionals working in health facilities in Rwanda are exposed to the risks resulting from poor medical waste management practices. Thus, the study recommends putting more emphasis on raising awareness of staff towards risks resulting from poor medical waste management practices.
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Keywords: Occupational health risk; Medical waste; Health professionals, Hospital, Healthcare waste

Background

The Management of healthcare waste in an inappropriate way can be a source of severe diseases to health professionals, patients, waste handlers, and to the general public.[1,2] Literature indicates that healthcare workers are at high risk of getting infections due to their exposure to medical waste, mainly bloodborne pathogens.[3,4] The risks associated with infectious waste generated in healthcare settings are accidental needle stick injuries, which can cause different types of hepatitis and HIV as well.[5] Also, the exposure to harmful chemicals and radioactive waste used in health settings may constitute health hazards to healthcare workers as well as people out of the hospital premises.[6,7]

Equally important, scholars indicate that the operating environment of healthcare professionals is one of the most significant risky occupational areas.[8,9] A study conducted in India in 2001 on needle stick injuries

among healthcare workers in tertiary care hospital indicated that 59% of respondents reported having occupational exposure to blood and body fluid in the year preceding the study, and 50 % of nurses and 25.9 % of resident doctors had exposure to blood and body fluid.[9] Also, studies conducted in Portugal and Iran indicated that healthcare professionals are exposed to health hazards from medical waste. For instance, a study conducted in Portugal suggests that 23.4% of nurses and 12% of doctors experienced accidental injuries during patient care procedures. These accidents were linked to improper healthcare waste management. This study showed that 83 % of nurses had a high risk of being in contact with medical waste, and the risk of infection due to injuries from sharp waste was high.[10] Another study done among health professionals in a Teaching Hospitals in Tehran on occupational exposure to hazardous waste such as blood and body fluids indicated that more than 60.3% of the respondents confirmed their exposure to the risks related to medical waste.[11]

A study conducted in Kenya indicated that 20% of medical waste regenerated in Nairobi posed a challenge of high potential injuries and infection among medical waste handlers.[12] The same study indicated that accidents related to biomedical waste management were linked to insufficient knowledge towards waste categorization at point of production, inattention to directives and rules pertaining medical waste management, inadequate training, cognizance, inappropriate legal framework and policy enforcement related to waste handling, and the insufficient knowledge on waste categories and processing of medical waste. [12] Literature showed that inadequate segregation of biomedical waste exposed healthcare staff and waste handlers as well as administration staff.[13]

In Rwanda, health care facilities across 30 districts of the country, including the referral hospitals, generate large quantities of medical waste. It is estimated that 4,171 tons of healthcare waste are produced annually, and this increase is projected to the rate of 5% per annum.[14] In 2014, a report the Ministry of Health highlighted some weakness in medical waste management such as the absence of plans towards hospital medical waste management; lack of regulatory framework among others.

To prevent the hazards and risks associated with medical waste management practices among health professionals, patients, and the general public, the Ministry of Health (MoH) in Rwanda, established guidelines and standards of procedures for proper medical waste management. Also, the MoH has been organizing training related to medical waste management to reduce those hazards and risks. However, there is little evidence showing the occupational health risks connected to medical waste practices among health professionals in hospitals in Rwanda. The lack of this information may accelerate the exposure of health care workers to those risks. It may also be a barrier to the achievement of sustainable development goals, especially goal six, which draws attention to clean water and sanitation.[15] This study, therefore, aimed at exploring the occupational health risks linked to medical waste management practices among health professionals of selected hospitals in Rwanda. The following research questions were formulated to guide this study:

- What quantity of medical waste is generated daily in three selected hospitals?
- What are the practices of health professionals that expose them to the risk from medical waste?
- How many cases of occupation health risks occurred among health professionals due to inadequate medical waste management?
- Which groups of health professionals are highly exposed to the occupational health risk among health professionals of selected hospitals?

Methods

This study was conducted in three selected district hospitals, namely Muhima, Kibagabaga, and Masaka Hospital. A cross-sectional study design using both qualitative and quantitative methods was applied. The study was quantitative, especially to quantify the occupational accidents that occurred. It was also qualitative to observe some practices towards medical waste segregation and the use of personal protective equipment as well.

The study population of this study was composed of 532 health professionals (physicians, nurses and paramedicals) working in the hospitals mentioned above. A purposive sampling technique was used to select the three district hospitals and key six informants such as hospital administrator and environmental health professionals as well. Also, a simple random sampling was used to calculate the total sample size of the study. The overall sample size was 228. This sample was made of 88 study participants representing Kibagabaga hospital, 69 from of Muhima, and 71 from Masaka hospital.

Since the number of nurses, medical doctors, and paramedicals is different in all selected hospitals, proportionate sampling technique was used to have a representative sample for each group of staff in each hospital. Therefore, Muhima hospital was represented by 4 medical doctors, 50 nurses and 15 paramedical staff. Masaka hospital was represented by 7 medical doctors, 47 nurses and 17 paramedical staff. Kibagabaga was represented by 8 medical doctors, 59 nurses, and 20 paramedical staff. Moreover, a systematic sampling technique was used to determine precisely the staff (depending on the interval) that would participate according to the list of staff in each category. After having the record from the department of Human resources, the starting point was a staff appearing as the first person on the list.

Questionnaires with close-ended and open-ended questions were used as data collection instrument.

This questionnaire was adopted from similar studies conducted in similar settings. Also, the semi-structured interview guide was developed and used to collect data from the informants, especially data related to the budget allocated to medical waste management as well as reporting the accidents resulting from medical waste management practices. Moreover, observation checklist also was used to observe some practices related to medical waste segregation. The response rate was 98.6%. Face to face data collection was assisted by enumerators. After collecting data, questionnaires were reviewed to check if they were complete. For quantitative data, coding, entry, and analysis were conducted using the Statistical Package for the Social Sciences (SPSS). The analysis of quantitative data was limited to descriptive statistics. Also, qualitative data were analysed using narrative method which focused on reporting what respondents said.

Researchers obtained ethical clearance from the Institutional Review Board of the University of Rwanda. Research ethics committees of the selected hospitals also provided permissions for data collection. After getting the ethical clearance from the university and authorisation from hospitals'management, the researcher organized the training of enumerators and explained to them the purpose of the study, all study information and data collection procedures as well. Respondents got explanations about the purpose of the research as well as the confidentiality and anonymity of their responses. Moreover, respondents were informed about the minimum risk of the study as well as their right to participate and withdraw from the study any time, or for any reason, and without any consequence. Respondents were asked to participate in this study by signing the consent form voluntarily.

Results

Socio-demographic characteristics of respondents

Table 1 shows that 81.4% at Muhima; 58.2% at Masaka, and 34.1% at Kibagabaga hospital have a working experience of less than 5 years. 70.4% at Muhima ; 41.2% at Kibagabaga ,and 63.8% of respodents have advanced diploma.

Table 1. Socio-demographic characteristics of respondents

Variables	Muhima hospital		Kibagabaga Hospital		Masaka Hospital	
Category of staff	N	%	N	%	N	%
Medical doctor	7	9.9	8	9.4	7	9.9
Nurse	40	56.3	51	60	40	56.3
Midwives	12	16.9	8	9.4	12	16.9
Paramedical	12	16.9	18	21.2	12	16.9
Total	**71**	**100**	**85**	**100**	**69**	**100**
Level of education						
Master	0	0	0	0.00	1	1.4
Bachelor	21	29.6	28	32.9	16	23.2
Advanced diploma	50	70.4	35	41.2	44	63.8
Secondary	0	0.0	22	25.9	8	11.6
Total	**71**	**100**	**85**	**100**	**69**	**100**
Work experience						
Less than 5 years	57	81.4	28	34.1	39	58.2
5years-10 years	11	15.7	40	48.8	20	29.9
10 years and above	2	2.9	14	17.1	8	11.9
Total	**70**	**100**	**82**	**100**	**67**	**100**

Quantity of medical waste generated daily in three hospitals

Table 2 indicates the amount of hazardous waste generated in these hospitals (0.57 kg/capita/day in hospital A; 0.28 kg/capita/day in hospital B; and 0.36kg/capita/day in Hospital C). However, this quantity is an estimate done by a responsible person in charge of environmental health, since there is no system of quantifying the waste generated daily. Also, a small quantity of waste with a high content of heavy metals is produced.

Table 2. Quantity of waste generated in three hospitals

Types of medical waste produced (in Kg/capita/day)	Muhima Hospital	Kibagabaga Hospital	Masaka Hospital
Infectious waste	0.57	0.28	0.36
General waste	1.42	0.72	0.82
Pathological waste	0.14	0.07	0.11
Radioactive waste	0.02	0.00	0.01
Sharps	0.02	0.01	0.01
Pharmaceutical waste	0.01	0.00	0.00
Chemical waste	0.10	0.00	0.03
Waste with a high content of heavy metals	0.00	0.00	0.00
Total	2.28	1.08	1.34

Practices that expose health professionals to the risks of medical wastes

Key informants from these hospitals mentioned that health professionals sometimes did not comply with the protocol of medical waste management. The hospitals provide materials and equipment to deal with medical waste, but in some cases, some healthcare workers do not use those materials and equipment. This results in a different kind of exposure to occupational hazards in different circumstances.

P1&P2 said: ": *Some cases of misuse of the safety boxes, improper use of personal protective equipment by some staff members expose health professionals and waste workers to the risk of infections, risk of physical injuries and another form of occupational health risks*." Also, data collectors observed some weaknesses in compliance with medical waste management protocol, particularly in waste segregation where coding and colors of waste bags were not respected.

Occurrence of occupational health risks among health professionals in hospitals

Table 3 shows that experienced occupational health risks are at a high level in two hospitals. 56.6% in hospital A and 49.3% in-hospital C while the rate is lower in-hospital B equal to 26.8%. A key informant (P1) from one of these hospitals confirmed the probability of occurrence of these occupational risks due to inadequate medical waste management and said: "Cases of accidents /physical injuries may occur in our hospital." The study also revealed that risks of physical injuries, risk of infections tended to be the leading occupational health risks to take place in these hospitals. P2 confirmed that, due to the absence of a reporting system, occupational health risk might be more. S/he declared: "since we do not have a reporting system regarding these occupational health risks, they are probably many, but we do not exactly know every risk that occurs."

Table 3. The occurrence of occupational health risk

Have you experienced occupational health risk at the workplace?	Muhima hospital		Kibagabaga Hospital		Masaka Hospital	
	N	%	N	%	N	%
Yes	48	56.5	19	26.8	34	49.3
No	34	40.0	46	64.8	31	44.9
I do not know	03	3.5	05	8.5	04	5.8
Total	**85**	**100**	**71**	**100**	**69**	**100**
Types of occupational health risk occurred						
Infection	21	43.8	04	21.1	15	44.2
Trauma	07	14.6	03	15.8	05	14.7
Physical injury	20	41.7	12	63.2	13	38.2
Fire	00	0.0	00	0.0	00	0.0
Radioactivity	00	0.0	00	0.0	00	0.0
Chemical	00	0.0	00	0.0	01	2.9
Total	**48**	**100**	**19**	**100**	**34**	**100**

Groups of health professionals that are highly exposed to occupational health risks

Several respondents in qualitative data confirmed that healthcare workers in maternity and injection departments are at high risk of exposure compared to other healthcare staff. P4, P5, & P20 argued: "*Staff from the maternity department are highly exposed to health risks compared to others*." P5 said: "*People from injection services are also at high risk*." P7 indicated that maternity healthcare workers are highly exposed due to methods of evacuating body fluids and inadequate training on waste management.

The P111 indicated that some nurses do not separate medical wastes. He/she said: "*For nurses when no segregation is done, they can injure themselves."* P122 said: "*Midwives have contacts with several infected body wastes*." P123 indicated that midwives work in very infective conditions with inadequate protective measures. In brief, poor segregation of waste, insufficient knowledge, and skills on waste management, lack of appropriate protective equipment in some departments, and overworking that leads to stress and extreme fatigue were mentioned as factors that expose health care workers to occupational health risks associated with medical waste management practices.

Discussion

The findings from this study revealed that the high quantity of waste generated is a non-hazardous waste. These findings are in line with the standards of the World Health Organization and other scholars which indicate that up to 80% of the total waste generated in the health care facilities are general waste, and 20% remaining are classified into hazardous medical waste.[16,17] Also, the findings of this study illustrated the lack of a system of quantification of medical waste generated. These findings are also in line with another study conducted by Dasimah Omar et al. which showed that, in three hospitals (Tumpat, Batu Pahat and Taiping), they did not know the quantity of wastes that were generating daily.[18,19] However, this lack of information related to the exact amount of waste generated in a health care facility is an indicator of weakness in medical waste management, and this may have negative effects on planning towards appropriate medical waste management, and minimization of occupational health risks among health professionals working in health care settings and waste workers as well.

The findings of this study also pointed out some poor practices regarding waste management in the study area, especially the separation of waste. Result illustrated that some healthcare workers sometimes do not comply with protocol in the context of medical waste separation. This finding is in line with other studies where scholars revealed weaknesses in healthcare waste segregation compared to the definite rules and standards where adherence to the standards is at a lower level.[7,19,20] Therefore, with inappropriate medical waste separation in hospitals, healthcare workers expose not only themselves but also waste handling workers to infections, injuries, and other occupational risks.[17] Commenting on this poor separation of waste, it might be linked to the lack of awareness particularly for new staff regarding risks associated with medical waste as indicated by scholars where health care workers in different countries do not have much knowledge about the risks related to hazardous waste generated in healthcare settings.[1]

Findings of the study showed that the risk of physical injuries and risks of infections represent a high probability of health threat associated with medical waste management practices. These findings confirm another study which indicated that the likelihood of injuries was high in public hospitals.[21] Those health workers who deal directly with patients, including nurses, are the ones that are highly exposed to occupational health risks associated with poor healthcare waste management practices.[21] Also, findings of this study pointed out that nurses, especially those working in injection and maternity departments, make a group of healthcare workers at risks of getting injuries from sharp medical wastes. This finding is in line with other studies that indicated nurses and operating room technicians as the ones who have a high risk of physical accidents resulting from injections compared to others.[22] This high exposure should be linked to the fact that these nurses and midwives are the ones who execute what has been prescribed by medical doctors such as injections, bandage, cleaning wounds, among others.

Limitations

Limitations of this study include the fact that these findings cannot be generalized to all clinical settings in the country since the study was conducted in three public hospitals. Also, the quantity of waste mentioned in this study is an estimate, not the real amounts.

Conclusion

This study aimed at exploring occupational health risks associated with healthcare waste management among health professionals of three district hospitals in Rwanda. The study concludes that healthcare workers in the three investigated public hospitals do not comply with protocol, and this inability exposes health professionals and the public to the occupational health risks. Some cases of occupational health accidents among healthcare workers in Rwanda occur but are not reported as there is no formal system of reporting occupational health accidents associated with medical waste. The study recommends that healthcare staff must comply with the protocol in the context of medical waste management. Another recommendation calls for the mobilization regarding healthcare waste management among health professionals to minimize occupational health risks.

This study also advocates for the establishment of an occupational health risk reporting system to have data on occupational health risks occurrence and take preventive measures accordingly.

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Conflict of interest
All authors report no conflict of interest.

Authors' contribution
J.K was responsible for the study conception and design and data analysis. N. K, M.C.I, M.M,E.U.C, I. K, L.B, and C.N contributed in searching the literature to support the analysis and data interpretation while D.B and I.H,contributed to the drafting, proofreading as well as editing of the manuscript.

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Profile of Injuries Among Sitting Volleyball Players with Disabilities in Rwanda

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Abstract

Background
Sports injuries are some of the risk of paralympics sport. Injuries are somewhat high compared with injury rates in able-bodied athletes. Injuries might have an impact on the participation and future health. It is paramount to investigate sports specific injuries to eliminate associated risks.
Aim
To identify patterns of injuries among sitting volleyball players in Rwanda.
Methods
A prospective quantitative study was conducted among 158 sitting volleyball players competing in the 2013-2014 season. The research team composed by physiotherapists used the data collection process following the consensus on injury definitions and data collection procedures. The ethical clearance and permission were obtained from relevant bodies. ANOVA or the Mann–Whitney U-test were used for continuous variables while Chi-square or Fisher's exact tests were used for categorical variables.
Results
All the 158 players aged 25±6 years participated in the study; with male predominance (66.5%). Fifty-eight players (37%) sustained at least one injury. Nearly half of injuries (n=43) were mild, consistent for both male and female. There was no statistical difference in the patterns of injuries comparing male and female participants.
Conclusion
Sitting volleyball players with disability in Rwanda sustained a high prevalence of injuries. The fingers, hands and wrists were the most injured body parts. However, the health and integrative advantages should outweigh the risk of adverse effects associated with participation in sports such as injuries.
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Keywords: Sitting volleyball, People with disabilities (PWDs), Injury

Introduction

People with disabilities (PWDs) should receive the same physical, mental, and social benefits from participating in sport and physical activity as those not having a disability.[1] The number of athletes with disabilities participating in organized sports and the popularity of the games for PWDs is steadily increasing around the world. Sitting volleyball is a sport developed for athletes with lower extremity impairment for example amputations; disabling joint injuries or conditions and limb weakness.[2] To raise awareness of the rights of PWDs, Rwanda has given the opportunity to around 300 persons and about 100 youth with disabilities to access sport and recreational activities (NPC).[3] The results of the study conducted by Barayagwiza indicated that the top five sports disciplines accessed by youth with physical disabilities in Rwanda were sit ball, sitting volleyball, volleyball, table tennis and wheelchair basketball[4].

The growing interest and participation in sports increase the risk for injury among athletes with disabilities. However, there are few studies concerning injury patterns, risk factors, and prevention strategies of injuries in paralympic sports. The study conducted by Fagher and Lexell[5] showed that the overall rates of injuries are considerably high and comparable with injury rates in able-bodied athletes.

Upper limb injuries are common in sitting volleyball. The report from the study conducted among athletes in paralympic games in 2012 indicated that the most commonly injured region was the shoulder (17.7%), followed by the wrist/hand (11.4%) and elbow (8.8%). [6] Furthermore, the most frequent type of injuries sustained by sitting volleyball players were sprains, dislocations of joints, and bruising of various body parts. The most common mechanisms of injuries

were spiking or blocking the ball.[7] These injuries contribute to serious joint and muscle dysfunction in addition to their disabilities and may lead to restriction in sports participation. However, there is a scarcity of information on common injuries in disability sports in general and particularly among sitting volleyball players with disabilities in Rwanda.

This study will provide baseline information about common injuries, patterns, mechanism and predisposing factors of injury among sitting volleyball players in Rwanda. This study will also raise awareness of the participants, team managers, staff and medical team about the occurrence of injuries to propose appropriate interventions.

Methods

Design

A prospective quantitative study was conducted among Rwanda male and female sitting volleyball players to record injuries throughout the season. The competitive season was from September 2013 to March 2014.

Population and sample

The study population comprised 158 Rwandan sitting volleyball players holding a valid league participation license to play in the 2013-2014 season. All the 17 teams were included in the study. Teams registered between 8 and 10 players (3 teams registered 8 players, 6 teams had 9 players and 8 teams had 10 players). The study included all the players participating in the league. We included all the 158 players that had been participating in team training practice sessions and had been actively taking part in league tournaments. Players presenting with pre-existing injuries were only included in the study once cleared to participate in training and matches. The sample size of 158 players was found to be enough to depict any significant difference in variables under investigation.

Data Collection tools and procedures

This study design followed the consensus on injury definitions and data collection procedures used in able–bodied studies of injuries.[7,8] A self-designed short form was used to collect demographic information of the players. The form included the age of the player, weight and height, playing position, playing experience, occupation and marital status. The information pertaining to the type of impairments was also included in the form. A standardised injury report form was used by the research team to collect data pertaining to the occurrence of injuries. The injury report form is comprehensive and injuries are recorded on the front side of the form, while all definitions related to the type, anatomical location and severity of the injury are provided on the back of the form. The operational definitions adopted in this study have been widely advocated for epidemiological studies in sports.[7,9] A recordable injury was the one that caused the player to be unavailable for full team participation in training or match play. All injuries were followed until the final day of rehabilitation corresponding to full training and match participation. The day on which an injury occurred was not counted when determining the severity of an injury. The severity of injuries was classified according to the days that players were unable to participate in full training or competition. An injury that caused a time loss of 1-3 days was classified as "minimal", while injuries that resulted in an absence from training or matches for 4-7, 8-21 and more than 21 days were classified as "mild", "moderate" and "severe" injuries respectively. A recurrent injury was defined as an injury of the same type and in the same location to the previously sustained injury within 2 months.

A familiarization session was organized for the research team to have a common understanding of the definitions used in the study, data collection tools and procedures. A formal research ethics approval from the University of Rwanda Institutional Review Board and appropriate permissions from the teams and participants' consent were sought. Before the beginning of the league, the research team collected information pertaining to the demographics of the participants as well as the impairments of the participants through a physical assessment. The assessment was done at the teams' convenient time. Data collection started on 8 September 2013 and ended on 29 March 2014.

Measures of injury

The research team visited each team on a weekly basis up on the start of the season to record any injury that happened in that particular week. This process was adopted because there were no medical personnel in the teams. Players were asked whether they had sustained any injury in the just ended week. If any, more data was recorded as to the date of injury, location, type and whether it is a recurrent injury. The date of return to play after injury was also recorded in the subsequent visit to account for the severity of injuries. The above information was recorded on the standardized injury report form.

Data analysis

The Statistical Package for the Social Sciences (SPSS version 16.0, SPSS Inc., Chicago, IL, USA) was used for statistical analysis. The numerical data were analyzed using descriptive statistics (mean and 95% confidence intervals) to describe each variable. The categorical and nominal variables were analysed using frequencies and proportions presented in form of percentages. Normality test were conducted for continuous variables using Kolmogorov-Smirnov and Shapiro-Wilk tests for skewness and kurtosis. Additionally, the visual representation of the data was also done for the stem-and-leaf, Q-Q plot and histogramme. The variables

age, weight and height were not normally distributed. Therefore, the non-parametric Mann–Whitney U-test was used for comparison between male and female participants. Categorical variables were compared between groups using the chi-square test, or Fisher's exact test for small numbers. The level of significance was set at $p<0.05$.

Ethical considerations

Ethical clearance was obtained from Institutional Review Board (IRB) from the University of Rwanda, College of Medicine and Health Sciences (CMHS) and permission was sought from the National Paralympic Committee (NPC). An information sheet was presented to the participants explaining the topic of research, the study procedures and the benefits. Participation was voluntary and consent forms were signed while parents or guardians signed for players below 18 years. The later provided also their assent to participate in the study. Participants were free to withdraw from the study at any time without explanation or any impact. The information was kept with high level of confidentiality. No names were written on the forms nor were used during data analysis and presentation.

Results

Demographic characteristics

There were 158 players that participated in the study. There were on average 9 ± 1 players per team. A large number of respondents were males (n=105, 66.5%) and a low number were female (n=53, 33.5%). The mean age of the players was 25 ± 6 years while the youngest player was 15 years old and the oldest was 47 years old. The players' mean experience was 3 ± 3 years, (interquartile range= 4).The majority of players (n=123, 78%) had 1-5 years of experience for both males and females. Mann-Whitney U test indicated that there was no difference in the distribution of age (p=0.940), weight (p=0.053) and experience (p=0.490) between male and female players. The details of the demographic characteristics are shown in Table 1.

Table 1. Demographic characteristics of the participants (n=158)

Variables		Total	Male	Female
		N (%)	N (%)	N (%)
Age group (years)	15-25	101(64)	66 (42)	35 (22)
	26-36	49 (31)	35 (22)	14 (9)
	37-47	8 (5)	4 (3)	4 (3)
Weight (Kg)	40-60	98 (62)	62 (39)	36 (23)
	61-81	58 (37)	43 (27)	15 (9)
	82-102	2 (1)	0	2 (1)
Experience (years)	1-5	123 (78)	77 (49)	46 (29)
	6-10	32 (20)	26 (16)	6 (4)
	11-15	3 (2)	2 (1)	1 (1)
Marital status	Single	123 (78)	82 (52)	41 (26)
	Married	35 (22)	23 (15)	12 (8)
Occupation	Student	63(40)	41 (16)	22 (14)
	Cultivator	27 (17)	17 (11)	10 (6)
	Public worker	11 (3)	11 (7)	2 (1)
	Professional player	21(13)	16 (10)	5 (3)
	Business	21 (13)	11 (7)	10 (6)
	Jobless	13 (8)	9 (6)	4 (3)
Playing position	Server	39 (25)	24 (15)	15 (9)
	Attacker	38 (24)	25 (16)	13 (8)
	Receiver	9 (6)	6 (4)	3 (2)
	Defender	59 (37)	39 (25)	20 (13)
	Blocker	13 (8)	11 (7)	2 (1)

Types of disability among sitting volleyball players

Among 158 sitting volleyball players, 108 (68%) had deformities while 53 (32%) were amputated. The foot and ankle complex was the body part with the most prevalent deformities (n=32, 20%) followed by knee joint (n=24, 15%) and the lower leg (n=18, 11%). Lower limb amputation was also observed with more below knee amputations (n=23, 14%) followed by equal number of through knee and above knee amputation with the frequency of 11 (7%) each. Eight participants represented with the upper limb deformities.

Prevalence of Injuries

Out of 158 sitting volleyball players 58 (37%) sustained at

least one injury. Thirty-five (22%) players sustained one injury while 23 (15%) sustained two or more injuries. Out of 105 male sitting volleyball players, 37 (35%) sustained injuries while 21 (40%) out of 53 females were injured. Forty-eight percent of injuries (n=43) were mild which is consistent for both male and female. Moderate injuries constituted 25% of injuries (n=22) with proportional contribution for male and female. Recurrent injuries were also reported to represent 26% of injuries (n=23). There was no statistical difference in training, match, severity or recurrence of injuries comparing male and female (Table 2).

Table 2. Prevalence of injuries during training and competition stratified per gender (n=89)

Injuries	Characteristics	Total n (%)	Male n (%)	Female n (%)	P-value
Total injuries		89 (100)	60 (67)	29 (33)	
Training injuries		46 (52)	31 (35)	15 (17)	0.823
Match injuries		43 (48)	29 (33)	14 (16)	0.823
Number of Injuries per player					
	1	35 (39)	22 (25)	13 (15)	0.610
	>1	23 (26)	14 (16)	8 (9)	0.211
Severity					
	Minimal	20 (22)	16 (18)	4 (4)	0.275
	Mild	43 (48)	29 (33)	14 (16)	0.823
	Moderate	22 (25)	12 (13)	10 (11)	0.222
	Severe	4 (4)	3 (3)	1 (1)	1
Recurrence					
	Non-recurrent	66 (74)	45 (51)	21 (24)	0.800
	Recurrent	23 (26)	15 (17)	8 (9)	0.800

Severity of injuries by location and type

The severity of injuries was classified according to the days that players were unable to participate in full training or competition. An injury that caused a time loss of 1-3 days was classified as "minimal", while injuries that resulted in an absence from training or matches for 4-7, 8-21 and more than 21 days were classified as "mild", "moderate" and "severe" injuries respectively. The days lost due to injuries were computed from the date next to the day of injury to the date of return to full participation in the game.

Upper limbs were the most affected body parts (n=67, 75%) with more injuries to the fingers (n=17) followed by the wrist (n=15) and the hand (n=14). There was no statistically significant difference in the occurrence of injuries according to the anatomical location. Strains (n=34) were the most prevalent injury type followed by contusions (n=26). Females sustained more dislocation injuries than males, with a statistically significant difference. All the recurrent injuries were "early recurrent" happening within two months. More than half of recurrent injuries (52%) were moderate while mild and minimal had 22% of injuries each. Recurrent injuries caused significantly longer median absence time than first time injuries (p =0.001). Table 3 shows the details of the location and type injuries according to the severity.

Table 3. Severity of injuries according to location and type (n=89)

	Total	Severity			
Injuries	n (%)	Minimal	Mild	Moderate	Severe
Injury location					
Head/ face	1 (1)	1	0	0	0
Shoulder	8 (9)	0	4	4	0
Elbow	10 (11)	3	5	1	1
Wrist	15 (17)	3	8	4	0
Hand	14 (16)	2	9	3	0
Finger	17 (19)	4	9	2	2
Forearm	3 (3)	1	1	1	0
Back	6 (7)	3	1	1	1
Buttock	6 (7)	1	3	2	0
Thigh	2 (2)	1	1	0	0
Knee	6 (7)	1	2	3	0
Ankle/ foot	1 (1)	0	0	1	0
Injury type					
Contusion	26 (29)	5	17	4	0
Dislocation	10 (11)	0	2	7	1
Fracture	2 (2)	0	0	0	2
Laceration	9 (10)	3	6	0	0
Sprain	34 (38)	9	15	10	0
Strain	3 (3)	1	2	0	0
Other	5 (6)	2			
Recurrence			1	1	1
Recurrent	23 (26)	5	5	12	1
No recurrent	66 (74)	15	38	10	3
Total	89 (100)	20	43	22	4

Number of days lost due to injury by location and type

A total of 669 days were lost due to injuries with the worst injury causing the player to miss 54 days. Sprain constituted the highest number of injuries affecting mostly the fingers, wrists and shoulders and knees. Contusions were the second most common injury type affecting mostly hands, elbow and buttocks. The consequence of injury was also assessed by the days of play lost due to injury, and this showed that elbow injuries accounted for 23% of time lost for female players followed by the hand (14%). For males, injuries to the fingers accounted for 29% of time loss injuries followed by the wrist (17%) and the shoulder (14%) (Table 4).

Table 4. Number of days lost by location and type of injuries

Location	Type	Frequency	Mean ± SD	Number of days lost
Ankle/ foot		1	8	8
	Sprain	1	8	8
Back		6	9 ± 10	55
	Strain	1	4	4
	Other	5	10 ± 11	51
Buttock		6	7 ± 6	39
	Contusion	6	7 ± 6	39
Elbow		10	9 ± 16	87
	Contusion	6	4 ± 3	25
	Dislocation	1	54	54
	Laceration	2	2 ± 1	3
	Sprain	1	5	5
Finger		17	9 ± 14	151
	Contusion	3	1	3
	Dislocation	1	17	17
	Fracture	2	43 ± 6	86
	Laceration	1	6	6
	Sprain	10	4 ± 3	39
Forearm		3	10 ± 9	29
	Contusion	1	3	3
	Dislocation	1	20	20
	Sprain	1	6	6
Hand		14	5 ± 6	69
	Contusion	7	4 ± 2	25
	Dislocation	2	18	36
	Laceration	4	2 ± 1	7
	Strain	1	1	1
Head/ face		1	7	7
	Laceration	1	7	7
Knee		6	8 ± 7	50
	Contusion	1	2	2
	Dislocation	1	15	15
	Sprain	4	8 ± 7	33
Shoulder		8	9 ± 7	69
	Contusion	1	2	2
	Dislocation	3	9 ±11	27
	Sprain	4	10 ± 6	40
Thigh		2	9 ± 7	8
	Laceration	1	6	6
	Strain	1	2	2
Wrist		15	6 ± 7	97
	Contusion	1	1	1
	Dislocation	1	18	18
	Sprain	13	6 ± 7	78

Discussion

Characteristics of the participants

The majority of sitting volleyball players in Rwanda are predominantly young. This is in line with the leading proportion of students. The increase in the number of youth students in the game follows the establishment of interschool paralympic competitions in Rwanda by NPC and interschool sports federation. The current study showed that most players had 1-5 years of experience; which meant that sitting volleyball is a new discipline for many players. Players in the present study are younger compared to those that participated in the study conducted by Molik and Mędasik.[11] A large number of players were male (67%) and a low number were female (33%). This may partly be explained by a high proportion of males with disabilities who are active compared to females in general. [12] In Rwanda, like in many other African countries, there is low participation in sports for females in general.[13] This might also be the case for females with disabilities. That is why female teams are not yet established and to facilitate inclusion the NPC decided that competing teams can use players with both gender without restriction of number. [14] This might explain the reason why no difference was observed in the demographic characteristics of the players according to gender.

The game of sitting volleyball is a sport developed for athletes mainly with lower extremity impairment for example amputations; disabling joint injuries or conditions, limb weakness.[2] This concur with the results of this study indicating that lower limb deformities and amputation were the types of disability among sitting volleyball players in Rwanda. Looking at the fact that the game is played using the upper extremities, eight players were found to have an impairment of the upper extremities. Though it could generally interfere with the performance, the players had minor deformities that could not restrict participation. The current study found that 67% of sitting volleyball players had a certain kind of deformity while 34.7% had amputation. This is in accordance with the study conducted by Molik and Mędasik[11]indicating that sitting volleyball players had predominantly amputation and lower limb paresis or poliomyelitis. However, the study conducted previously in the Hungarian sitting volleyball players indicated that the proportion of players having amputation was 39%.[15] The difference might be found in the causes of the disability or amputation. In many African countries, the leading causes of disability are infections and communicable disease. Other causes include war, trauma, accident and congenital noninfectious diseases.[16]

Injuries and severity

The main finding of this study was that 37% of the sitting volley ball players sustained injuries while 35% of males and 40% of females incurred at least one injury. . Upper limbs represented three-quarters of injuries affecting mostly the fingers, hands and wrists. Elbow injuries accounted for 23% of time lost for female players followed by the hand (14%). For males, injuries to the fingers accounted for 29% of time lost followed by the wrist (17%) and the shoulder (14%).

The results of this study indicated a higher prevalence (37%) of sitting volleyball injuries than reported in a similar study conducted by Willick et al.[6]which found the injury prevalence of 15%. These differences may be possibly explained by the fact that their sport activities are well organized and planed in terms of playing grounds, protective equipment like knee pads, ankle braces, and thigh compared to Rwandan sitting volley ball sport activities. In addition, players in paralympic games may be classified as elite and are mostly well conditioned. International players receive appropriate training that prepares the bodies to withstand the different stresses from the game.[17]However, higher percentages were found in sitting volleyball competing in major tournaments.[10,16]

Nearly half of injuries (n=43) were mild which is consistent for both male and female. Moderate injuries constituted a quarter of injuries (n=22) with proportional contribution for male and female. The consequence of injury was also assessed by the days of play lost due to injury, and this showed that elbow injuries accounted for 23% of time lost for female players followed by the hand (14%). For males, injuries to the fingers accounted for 29% of time loss injuries followed by the wrist (17%) and the shoulder (14%). The severity of injuries in terms of days lost among male and female players was due to fracture and dislocation.

Recurrent injuries represented about a quarter of injuries and caused longer lay off time compared to first time injuries. Though it was not assessed, injuries might be poorly managed which lead to recurrence. There is therefore a need for appropriate management of injuries to reduce the rate of recurrent injuries and time lost due to injuries.

Injury type and location

There was no significant difference of the type of injuries according to gender. The present study showed that the most common type of injury was sprain that affected mostly the fingers, wrists, shoulders and knees. Similarly, the study conducted by Molik and Mędasik[11]found that the wrist and fingers were the most affected body parts (46%) followed by the shoulder and arms (22%). Contusions were the second most common injury type affecting mostly hands, elbow and buttocks. The authors[11]found that contusion was the most prevalent type of injury followed by abrasion, dislocation/ fracture. Contrary, sitting volleyball players competing on international level reported injuries to the back and shoulder injuries.[18] Additionally, Wieczorek et al.[7] reported that persons with dysfunction of one limb, with the other limb for play, are often exposed to the overtraining of the healthy limb.

Limitations
Little information has been published regarding the prevalence of injury among sitting volleyball players. Detailed information regarding injuries could not be obtained because there were no health professionals in the teams. Data collection was based on self-reports that are often open to bias and misreporting. This was minimized by the weekly visits to the teams by the research personnel. As there is no guideline on data collection procedure for injuries in sports with disability, we used the consensus on injury definitions and data collection procedures used in able-bodied studies. The sample size was small which caused limitations in drawing strong conclusion.

Conclusion and recommendations

The study found a high prevalence of injuries among male and female sitting volleyball players with disability in Rwanda. The body sites prone to injuries in this study were fingers, hands and wrists. The common types of injuries were sprain followed by contusions. Nearly half of injuries were mildly and moderately severe. A quarter of injuries were recurrent and half of them were moderately severe and caused significant longer lay off time than first time injury. This study indicated that persons presenting with disability should not encounter barrier in undertaking sitting volleyball especially in a low-income country with limited resources. However, the health and integrative advantages should outweigh the risk of adverse effects associated with participation in sports such as injuries. There is therefore a need for injury prevention intervention. Further studies are also needed in this area taking into consideration individual exposure to establish risk factors for injuries.

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Conflict of interests
There are none.

Authors' contribution
AN, BHN, JBN, AFN, and JS were responsible for the conceptualisation, design, data collection and analysis. AN, AK, and JBS contributed to the interpretation of the data, the writing and revisions to the manuscript. All authors approved the final version of the manuscript.

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Indwelling Urinary Catheter Placement and Removal Practices among Surgical Patients at Kigali University Teaching Hospital

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Abstract

Background

Indwelling urinary Catheters (IUCs) are routinely used medical devices among patients undergoing surgery and their undue use is a risk factor for urinary tract infections (UTIs). The study aim was to assess IUCs placement and removal practices among patients undergoing surgery.

Methods

We carried out a cross-sectional study on 207 patients operated at Kigali University Teaching Hospital (KUTH). A pretested observation checklist (Cronbach: α=0.851) was used for data collection. The data were analyzed using SPSS version 20. Chi-square test was used to determine the association between patients' characteristics and IUCs placement and removal.

Results

The IUC placement rate was 56.5% (n=117). There was significant association of IUCs use with gender, age, type and urgency of surgical procedures performed and the type of anesthesia used. Appropriate indication for IUC placement was established in 95.7% patients (n=112). Although 99.1% (n=116) patients were discharged from theatre with IUCs in situ, only 56.5% (n=66) had documented removal instructions.

Conclusion

This study established that IUCs use is common and justified in surgery. However, lack of removal instruction was found to be a challenge. Therefore, the authors recommend patients' re-evaluation for post-surgery IUC need and its early removal where inappropriate to prevent CAUTIs and other complications.

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Keywords: Indwelling urinary catheter use, surgical patients, surgery

Introduction

Urinary catheters are medical devices that are mostly used in critical care services [1] including operating theatres. About 15% to 25% of hospitalized patients, with up to 100% in the critical care unit, are exposed to urinary catheterization.[2,3] Most of the urinary catheterizations (21% to 63%) are done without proper indications or placed for appropriated indications but unnecessarily prolonged.[4]

The catheter-associated urinary tract infections (CAUTIs) are considered the most challenging healthcare-associated infections (HCAIs) worldwide.[1,5–7] IUCs placement contribute up to 40% of HCAIs,[2,7] corresponding to one million of CAUTIs each year.[4] An IUC is also contributes 80% of UTIs morbidity among hospitalized patients,[8] 48% of antimicrobial resistance[8] with a related cost of US$676 on admission and $2836 when complicated by bacteraemia.[4] The CAUTIs bacteria are coupled with higher antimicrobial use and resistance.[9]

Urinary catheterization is mostly done as perioperative routine care for the safety, and monitoring of the effectiveness of surgery.[5] However, CAUTIs are the third most common postoperative infections in addition to surgical site infection and bloodstream infection among operated patients.[10] IUC was also linked with other non-infectious complications like urethra trauma, discomfort and immobility.[4,11,12]

Different interventions to prevent CAUTIs have been studied for their effectiveness including the use of different types of catheters [1,13–15] like antiseptic, antibiotic, and silver coated catheters among others.[1] However, none revealed significance in reducing CAUTIs. Thus, the non-use or appropriate use of urinary catheter has been found to be effective in reducing the incidences of CAUTIs. The effective strategies to prevent CAUTIs after surgery are no placement or immediately removed catheter.[16,17] They cut down the rate of CAUTIs(17% to 65%).[18]

The Centre for Disease Control (CDC) through

the Healthcare Infection Control Practices Advisory Committee (HICPAC) provided guidelines for using appropriately an IUC to prevent and reduce the cost of CAUTIs. The main guideline is to avoid unnecessary use of a urinary catheter.[19] HICPAC issued indications for appropriate use of IUC.[20] CDC recommended perioperative IUC use in the following conditions: "(1) urologic surgery or other surgery on nearby structure of genitourinary tract, (2) predictable prolonged duration of surgery and this catheter has to be removed in PACU, (3) patients expected to receive large amount of fluids or diuretics during surgery".[11,21] For patients with urine retention, those with sacral or perineal wounds and are incontinent and those with the need for immobilization following surgery,[21] IUC placement should be performed under medical order and in theatre. CDC recommends that an IUC placement for any inappropriate reason should be removed immediately. [21,22]

In Rwandan hospitals, the IUCs are being used among hospitalized patients including those who are undergoing surgeries. The bacteria like Klebsiella, Proteus, Citrobacter, Pseudomonas aeruginosa were predominantly isolated in patients with IUC, hospitalized in two University teaching hospitals. The associated antimicrobial resistance varied from 98.9% for amoxicillin, 90.4% for trimethoprim–sulphamethoxazole, 74.6% for nalidixic acid, 72.3% for amoxicillin-clavulanic acid, 57.4% for ciprofloxacin, 54.3% for ceftriaxone, 53.2% for nitrofurantoin to 50% for ceftazidine and other antibiotics which are commonly used medications to treat UTIs in Rwanda.[9] However, there is no study conducted about the use of IUC in Rwandan hospitals especially among perioperative patients. This motivated the researchers to carry out this study.

Methods

The study took place at operating rooms of KUTH among patients operated between 21st March and 21st April 2017. A cross-sectional study design was used. The hospital admits patients referred from district hospitals for further evaluation, diagnosis and treatment. The hospital is located in Kigali, the capital city of Rwanda. This hospital has two operating theatres, main theatre and maternity theatre each with eight operating rooms. Both theatres operate 420 patients on average per month that constituted the study population. Patients undergo different types of surgery which may include general surgery, Gynaecology & Obstetrics, Ear Nose Throat (ENT), Ophthalmology, Neurosurgery, Plastic and reconstructive Surgery, Orthopaedics and trauma surgery, vascular surgery, Urology, Oral and Maxillo-facial surgery, paediatric surgery and sometimes thoracic surgery to exclude cardiac surgery. Major organ transplant surgery such as kidney, liver and heart was not yet available in the hospital.[23] The study recruited patients of all ages with different diagnoses, scheduled for emergency or elective surgery and whether the IUC was inserted in theatre or in the ward for surgical purpose. Patients admitted to the operating theatre (OT) with an indwelling urinary catheter placed for other than surgical reasons were excluded from the study.

The sample size was estimated using Yamane Formula

$$n = \frac{N}{1 + N(e)^2}$$

at a confidence limit of 95% and accepted margin error of 0.05. N was the estimated number of patients expected to undergo surgery in both OTs of KUTH for a period of one month that was 420 patients. The estimated sample size was 205 participants. A proportional sample was conveniently selected in both OT.

The institutional review boards of the University of Rwanda and KUTH approved the study. Individual consents were signed by patients who were meeting the conditions for signing a consent, next of kin for unconscious adult patients, parents or guardians for under 18 years old children. Fourteen to 17 years old children signed an assent form while their parents or guardians signed a consent form.

A pre-established observation checklist adopted from Catheter out project developed by Michigan University and sponsored by Agency for Healthcare Research and Quality (AHRQ) [20] was used to collect data with permission. Minor modifications were made to adapt it for local use in the perioperative period. The tool was tested for reliability on 17 patients before data collection who did not participate in the real study. The study tool was reliable at a Cronbach's α of 0.851. The data were analysed using the statistical Package for Social Sciences (SPSS) software version 20. Both descriptive statistics and inferential statistics were used. Descriptive statistics were used to display data in frequencies and percentages of the characteristics of participants, and prevalence of IUC use. A Pearson chi-square test and Fisher exact test were calculated to identify the association of participants' characteristics with IUC placement and removal. The patients who were not exposed to IUC during their surgery were filtered and excluded before analysing the IUC removal rate and removal instructions.

Results

Among the 207 patients sampled, 108 were admitted in the main theatre and 99 in the maternity theatre. The demographic characteristics of participants (Table 1) show that majority were females (58.45%) and their mean age was 34.7years (SD: ±17.7). The majority underwent emergent (57.5%), major (97.5%), and obstetrics & gynaecology surgeries, under general anaesthesia (58.5%) and regional anaesthesia (40.6%).

Table 1. Demographic characteristics of participants

Variable	Value	Frequency	Percentage
Age	<15 years	17	8.2%
	15-25 year	31	15.0%
	26-35 years	83	40.1%
	36-45 years	35	16.9%
	46-56years	13	6.3%
	56years and above	28	13.5%
Sex	Female	121	58.5%
	Male	86	41.5%
Type of Surgery performed	Urology	6	2.9%
	Obstetrics & gynaecology	65	31.4%
	Orthopaedics	34	16.4%
	Laparotomy	35	16.9%
	General	39	18.8%
	ENT	16	7.7%
	Neurology	12	5.8%
Seriousness of surgery	Minor	4	2.5%
	Major	203	97.5%
Urgency of surgery	Emergent	119	57.5%
	Elective	88	42.5%
Type of anaesthesia used	Local anaesthesia	2	1.0%
	Regional anaesthesia	84	40.6%
	General anaesthesia	121	58.5%
Total		**207**	**100%**

Regarding the prevalence of IUC, 117 patients out of 207 participants (56.5%) were exposed to IUC and 80.3% of them were catheterized in operating room. A Cross tabulation and calculated chi-square test helped to identify the characteristics significantly associated with IUC placement to include age (P<0.001), gender (P<0.001), type of surgery (p<0.001), Seriousness of surgery (p<0.001), Urgency of surgery (p<0.001) and Type of anaesthesia used (P=0.002).

The IUC placement rate was as high as 78.3% in 26-35 years group participants, 71.9% in female, 93.8% in patients operated for obstetric and gynaecologic conditions, 73.1% in emergent surgeries and 70.2% in patients operated under regional anaesthesia.

Table 2. Prevalence of IUC placement, association with IUC Placement with characteristics

Demographic characteristics,		N	IUC Placement		Association with IUC placement		
			IUC placed n (%)	IUC not placed n (%)	X^2	df	sig
Age	<15 years	17	1(0.9)	16(94.1)			
	15-25 year	31	15(48.4)	16(51.6)			
	26-35 years	83	65(78.3)	18(21.7)			
	36-45 years	35	16(45.7)	19(54.3)			
	46-56years	13	6(46.2)	7(53.8)			
	56years and above	28	14(50)	14(50)	**37.329**	**5**	**<0.001**
Sex	Female	121	87(71.9)	34(28.1)			
	Male	86	30(34.9)	56(65.1)	**28.030**	**1**	**<0.001**
Type of Surgery	Urology	6	4(66.7)	2(33.3)			
	Obst&Gyn	65	61(93.8)	4(6.2)			
	Laparotomy	35	30(85.7)	5(14.3)			
	Orthopedic	34	9(26.5)	25(73.5)			
	Neurosurgery	12	8(66.7)	4(33.3)			
	General	42	6(14.3)	36 (85.7)			
	ENT+Maxillofacial surgery	16	0	16(100)	1.129	6	<0.001
seriousness of surgery	Minor surgery	5	2(40)	3(60)			
	Major surgery	203	116(57.1)	87(42.9)	21.215	2	<0.001
Urgency of surgery	Emergent	119	87(73.1)	32(26.9)	31.341	1	<0.001
	Elective	88	30(34.1)	58(65.9)			
Anaesthesia used	Local anesthesia	2	1(50)	1(50)			
	Regional anesthesia	84	59(70.2)	25(29.8)			
	General anesthesia	121	57(47.1)	64(52.9)	11.158	2	0.002
	Total	**207**	**117(56.5)**	**90(**43.5)			

The study findings identified that 95.7% (n=112 out 117) of patients with IUC in place had an appropriate indication for IUC placement (Table3). Therefore, the majority of participants with IUC in place (56.4%, n= 66) did not have a documented removal instruction from the surgeon. Only 27.4% (n=32) had within 24 hours removal instruction and 12% (n=14) had 24 hours to 48 hours removal instruction (Table 4). The surgeons recorded IUC removal instructions in patients' files as postoperative instructions, mostly in obstetric and gynaecological surgeries (68.9%). The removal instructions were not documented in Orthopaedic, Neurologic and General surgeries (Table 4). Only one catheter in a patient who had undergone gynaecological surgery was removed immediately after surgery.

Table 3. Indications for IUC Placement among patients undergoing surgery

Indication of IUC	Appropriateness of indications		
	Inappropriate indication	Appropriate indication	n
Urologic surgical procedure	-	7	7
Surgery contiguous to genitourinary track	-	50	50
Emergency surgery with anticipated large fluid resuscitation	-	23	23
Prolonged duration of surgery	-	6	6
Intraoperative Urine output monitoring	-	18	18
Need for immobilization	-	6	6
Sacral or perineal wounds in incontinence	-	2	2
Fluid monitoring in non-critical patient	1	-	1
Incontinence	2	-	2
Immobility not related to trauma	2	-	2
Total	**5(4.3%)**	**112(95.7%)**	**117**

Table 4. Postoperative IUC removal instructions recorded by the surgeon

Type of Surgery performed n (%)	IUC removal instructions					
	Removal within 24 hours	Above 24 hours to 48 hours	More than 48 hours (4)	No removal instructions (5)	Any Other (6)	N
Urology surgery	0	1(25)	0	3(75)	0	4(100)
Obst & Gyn	31(50.8)	9(14.8)	0	19(31.1)	2(3.3)	61(100)
Laparotomy surgery	1(3.3)	4(13)	1(3.3)	22(73.3)	2(6.7)	30(100)
Orthopedic surgery	0	0	0	8(100)	0	8(100)
Neurologic surgery	0	0	0	8(100)	0	8(100)
General surgery	0	0	0	6(100)	0	6(100)
Total	**32 (27.4)**	**14 (11.9)**	**1 (0.9)**	**66 (56.5)**	**4 (3.4)**	**117**

Discussion

Starting with demographic characteristics of the study participants (Table1), almost three quarters (73.3%) of the respondents were 15-45 years old. This is closely similar to national demographics [24] in which 71.6% of the total population is between 15-34 years old. Most of the participants were females in child bearing age and underwent obstetrics & gynaecology surgeries (31.4%) which were dominating surgical procedures in this study. In line of the leading surgeries, (58.45%) were female whose surgery necessitated the use of urinary catheters to protect their pelvic organs.[25] Similarly, previous studies have shown the dominating number of women is surgery compared to men.[26,27] On the contrary, Walaszek[10] reported male dominance having studied neurosurgical patients only.

Besides Obstetrics & Gynecology, other procedures performed included general surgeries, laparotomy surgeries and orthopedic surgeries. Most of these surgeries were classified major and emergent according to KUTH protocol of surgical classification. Being a teaching and referral hospitals, most of the time, the hospital admits complicated patients referred from smaller health care institutions. This is in agreement with the global distribution of surgeries that estimated the higher proportion of emergent obstetric surgeries in low-income countries, Rwanda included.[28] A study in East African countries[29] showed that the scope of surgical procedures undertaken are narrow while the emergent life-saving procedures and obstetric surgeries are the most commonly performed procedures. Another study[27] added to the list of abdominal surgeries-mainly laparotomies' and orthopedic surgeries especially

of the extremities in tandem with this study.
Considering the the factors that guide the choice of anesthesia[30], general anaesthesia technique and spinal anaesthesia were the most used in this study. This conformed to anesthetic practices at KUTH in addition to patients' considerations and was similar to techniques reported in the previous study.[27] In contrast, other studies[26,31] found that the majority of participants were operated under spinal anesthesia (70%), a technique that provides a reversible loss of sensation in a specific region or area [31].

This is attributed to the fact that their study was conducted among patients undergoing hip surgery and did not require patients to sleep. Similar to findings of other previous studies,[26,27] the IUC placement rate was significant associated with age, gender, type of surgical operation, seriousness and urgency of surgery and anesthesia technique used. Previously, a higher prevalence rate of IUC use has been reported in cardiac surgery.[32] Regional anesthesia has been associated with postoperative urine retention[33] hence the use of IUC postoperatively. Moreover, the study[27] found that among the patients operated in different surgical specialities, IUC was needed by 8.6% depending on their bladder capacity and 11.8% without considering individual bladder capacity.

The type, location and duration of the surgery determine the need for use or non-use of IUC. This justifies the routine use of IUC in some procedures such as obstetrics and gynaecology surgeries as well as in Laparotomies. IUCs are placed to empty bladder before pelvic surgery to prevent risks for bladder injuries and traumatizing other pelvic organs, to monitor input & out and for fluid resuscitation in prolonged surgeries. In contrast, some studies have evidenced that IUC is not required in caesarean delivery, hysterectomy and other gynecologic procedures, if the patient is haemodynamically stable. [34,35] Such patients are usually requested to void and empty bladder before surgery.

Although the duration of postoperative IUC retention and factors associated with non-immediate removal of the catheter were not explored within the scope of this study, prolonged duration of postoperative IUC was reported in previous studies to be associated with poor outcomes and complications.[34–37]. This study identified that the IUC removal instructions were not documented in 56.5% only and only 27.3% were recommended to be removed within 24 hours.

Further revelation from this study shows that only one (0.9%) catheter was removed among 107 IUCs that were judged unnecessary in both general and maternity OTs based on available evidence, CDCs recommendations [21] and clinical status of the patients. However, immediate IUC removal after the procedure is recommended if the catheter is not required to remain in-situ in order to prevent postoperative CAUTIs and other related complications.[2,5,38,39] To prevent post-operative CAUTIs, the third most common postoperative infections,[10,37] all perioperative patients care team should know and carefully apply the principles of aseptic and sterile techniques at all times during procedures.[40]

Although CDC recommends that perioperative IUC is used for a medical reason and not for routine or convenience of care,[20,21] most studies have not ventured to assess the preoperative medical diagnosis and the duration of surgery that may guide the surgeon in deciding the use or non use of IUC perioperatively.

Conclusion and recommendation

Indwelling urinary catheter is commonly used in surgical patients at KUTH and as a routine in some procedures such Obstetrics & Gynecology, laparotomy, urology, neurologic, emergent surgeries, surgeries performed under spinal anesthesia, females and 26-35 years old group. IUC placement was significantly associated with age, gender, type, seriousness and urgency of surgery, and type of anaesthesia used. The IUCs were placed for appropriate indications according to CDC guidelines such as surgery contiguous to genitourinary track, emergent surgery with anticipated large fluid resuscitation; intraoperative urine output monitoring and physician order was present in 61.5% of placed IUCs. The IUC removal instructions were not documented in 56.5% of patient with catheter in situ, especially patients operated in orthopedic, laparotomy, neurosurgery, and general surgeries. Only 1IUC was removed before patients left the PACU. The IUC retention and related complications after surgery were not assessed in this study. Again, additional information on the patients' conditions, duration of surgery and the specific procedure guidelines for IUC use still needs to be investigated. Therefore, the authors recommend patients' re-evaluation for post-surgery IUC need and its early removal where appropriate to prevent CAUTIs and other complications.

Limitations

The study was conducted in one hospital, hence limiting the generalizability of the findings. The gravity of diagnosis and the time required by surgery determine the need for IUC; unfortunately, they were not assessed in the scope of this study.

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Conflict of interest
The authors declare no conflicts of interest.

Authors' contribution
The authors contributed in the conception of the study framework, writing the research proposal, developing and validating the study tool, conducting or guiding data collection and analysis and development of the manuscript for publication.

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Hospital Acquired Infections in Pediatrics Unit at Butare University Teaching Hospital (CHUB)

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Abstract

Background
Hospital acquired infection (HAI) also called nosocomial infection is an infection acquired in hospital or other healthcare facilities. HAIs are a major public health problem all over the world, but particularly in developing nations and they are among the major causes of death and increased morbidity among hospitalized patients. It was found that HAI in sub-Saharan Africa is the major cause of illness and death in children.
Aim
The aim of this study was to provide knowledge on the prevalence of hospital acquired infection in pediatric unit of the University Teaching Hospital of Butare (Rwanda).
Methods
Hospital acquired infections surveillance method and definition of infections described by CDC/NHSN were used.
Results and conclusion
This study showed that the prevalence of HAI was very high (12.1 %) and the main bacteria causing NIs in pediatric unit were *Kleblesiela pneumonia*, followed by *E. coli* and *Staphylococcus aureus*. Low Respiratory HAIs were the most prevalent.
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Key words: Prevalence, Hospital Acquired infection, Pediatrics

Introduction

Hospital acquired infection (HAI) also called nosocomial infection (NI) is an infection acquired in hospital or other healthcare facilities by a patient in whom the infection was not present or incubating at the time of admission. HAIs are a major public health problem all over the world, but particularly in developing nations. Factors which promote HAIs includes: the increasing variety of medical procedures and invasive techniques creating potential routes of infection; decrease immunity among patient and the transmission of drug-resistant bacteria among crowed hospital populations, where poor infection control practices may facilitate transmission.[1]

A study done in Norway between 2002 and 2003 showed that nosocomial infection varied between 5.1 % and 5.4 % while in another study done in the University medical Center of Rabat in Morocco in 2012 the prevalence was 10.3 %.[2,3] A prevalence survey conducted in 55 hospitals of 14 countries representing 4 WHO regions found an average of 8.7 % of patients with HAIs. Over 1.4 million people worldwide suffer from infectious complications acquired in hospital and the later are among the major causes of death and increased morbidity among hospitalized patient.[1] In Africa, where many hospitals are severely overcrowded, and frequently suffering from shortages of basics supplies such as clean linen and running water, no data exist on the prevalence of HAIs.[4]

The WHO Patient Safety programme did a systematic review of health-care-associated infection in developing countries between 1995 and 2008 and found no reports about nosocomial bacteraemia in adults or children in Africa.[5] Nosocomial infections are the most cause of illness and death in children.[4] To our knowledge there is no data in Rwanda and particularly at the University Teaching hospital of Butare (CHUB) on the Prevalence of bacterial species involved in hospital acquired infections. The aim of this study was to provide knowledge on the prevalence of hospital acquired infection in pediatric unit of CHUB where cases of nosocomial infections were suspected in the past years, forming prerequisites for effective and sustainable infection control measures.

Methods

All inpatients of pediatric unit of CHUB from the 1st of June to the 30th of November 2015 were enrolled in this

study to investigate clinical illness both on admission and during hospital stay. CHUB is a University teaching Hospital situated in the Southern Province of Rwanda. Ethical clearance was obtained from the IRB of the College of Medicine and Health Sciences of the University of Rwanda. A written consent was obtained from the parents or guardians of the children. Hospital acquired infections surveillance method and definition of infections described by CDC/NHSN were used.[6,7]

On a daily basis, all patients admitted to the unit were evaluated for HAI. Hospital acquired Infection was defined as new infection which occurs after 48 hours of admission, taking into consideration if it was acquired in the unit and with no evidence of the infection being in incubation at admission. This study was based on the following main types of HAIs: Urinary Tract Infections (UTI), Lower Respiratory Tract Infections (LRI) and Blood Stream Infections (BSI). Primary bloodstream infection was considered as laboratory confirmed infections with a positive blood culture not related to infection at another site (Excluding phlebitis) and clinical sepsis. Clinical Sepsis was reported when a physician has instituted treatment for sepsis and no apparent infection at another site, and a negative blood culture or no blood culture was taken. When the BSI was associated with a central intravascular line, LRI with mechanical ventilation, UTI with catheterization, it was recorded.[7]

Infection site definition were in agreement with CDC definitions. Demographic data, date and site of infection were collected for each patient. Pathogens associated with each hospital acquired infection site was reported. Coagulase-negative staphylococci, *Bacillus* spp, *Micrococcus* spp, and viridans group streptococci bacteria were regarded as contaminants. For statistical analysis, software packages "SPSS 16.0" was used. Frequencies were calculated using descriptive statistics

Results

Prevalence of Nosocomial Infection in the six months of the study

From June to November 2015, four hundred seventy six children were admitted in pediatric department of Butare University Teaching Hospital (BUTH). Among these, 12.10% had hospital acquired infections during their stay in the Hospital. The prevalence of HAI per month from June to July were: 13.4%, 20%, 6.17%, 8.41%, 11.11% and 15.78% respectively (See Table 1).

Table 1. Prevalence of Nosocomial Infection in the six months of the study

	June	July	August	September	October	November	June-November
Number of admitted patients for more than 48 hours	**82**	**70**	**81**	**107**	**63**	**76**	**476**
% of NI	**13.4**	**20**	**6.17**	**8.41**	**11.11**	**15.78**	**12.10**

Nosocomial infection by infection types

Among all cases of HAIs, 46,55% were Low Respiratory Infections (LRI), 36.2% were Blood Stream Infections (BSI) and 17.24% were Urinary Tract Infections (UTI). The prevalence of LRI due to Nosocomial Infections were high in July with 71.42%, followed by November 58.33% and June with 54.54% (See Table 2). For BSI due to HAIs, October had the highest prevalence with 57.14 %, followed by November with 41.66%, August with 40%, June with 36.36%, September with 33.33% and July with 21.42%. About UTI due to NIs, August had the highest prevalence with 60%, followed by October with 42.85%, September with 22.22 %, June with 9.09% and July with 7.14% (See Table 2).

Table 2. Percentage of NI by infection types

	Percentage of NI by infection types						
	June	**July**	**August**	**September**	**October**	**November**	**Total**
LRI	54.54	71.42	0	44.44	0	58.33	46.55
BSI	36.36	21.42	40	33.33	57.14	41.66	36.2
UTI	9.09	7.14	60	22.22	42.85	0	17.24

Type of Infection Associated with Species involved in NIs

Among all recorded cases of hospital acquired infections, 51.66% were caused by *Klebsialla pneumonia*, 20% *Escherichia coli*, 18.33% *Staphylococcus aureus*, 3.33% for Acinetobacter and Enterobacter each and 1.66% for *Streptococcus pneumonia* and other Gram positive cocci each. Among all cases of HAIs caused by *Klebsialla pneumonia*, 80.64% were for LRI, 12.90% BSI and 6.41% UTI. For HAIs caused by *Escherichia coli,* 50 % were BSI and 50 % UTI. About HAIs caused by *Staphylococcus aureus*, 81.81% were BSI, LRI (9.09%) and UTI (9.09%) (See Table 3).

Table 3. Type of Infection Associated with Species involved in NIs

	Percentage of type of Infection Associated with Species involved in NIs		
Pathogens	LRI	BSI	UTI
Klebsiella pneumonia (n = 31)	80.64	12.90	6.41
Escherichia coli (n = 12)	0	50	50
Staphylococcus aureus (n = 11)	9.09	81.81	9.09
Enterobacter (n = 2)	50	0	50
Acinetobacter (n = 2)	0	100	0
Streptococcus pneumonia (n = 1)	0	100	0
Gram + Cocci (n = 1)	0	100	0

Percentage of bacteria isolates associated with infection types

In all LRI caused by HAIs, 92.59 were caused by *Klebsiella pneumonia*, *Enterobacter* (3.70%) and *Staphylococcus aureus* (3.70%). For BSI caused by HAIs, 39.13% were due to *Staphylococcus aureus*, *Escherichia coli* (26.08%), *Klebsiella pneumonia* (17.39%), *Acinetobacter* (8.69%), *Streptococcus pneumonia* (4.34%) and Gram + Cocci (4.34%). For UTI, 60% of HAIs were caused by *Escherichia coli*, *Klebsiella pneumonia* (20%), *Staphylococcus aureus* (10%) and enterobacter (10%) (See Table 4).

Table 4. Percentage of bacteria isolates associated with infection types

	Percentage of isolates by infection type		
Pathogens	**LRI**	**BSI**	**UTI**
Klebsiella pneumonia	92.592	17.391	20
Escherichia coli	0	26.086	60
Enterobacter	3.703	0	10
Staphylococcus aureus	3.703	39.13	10
Acinetobacter	0	8.695	0
Streptococcus pneumonia	0	4.347	0
Gram + Cocci	0	4.347	0

Discussion

The objective of this study was to provide knowledge on the prevalence of hospital acquired infection in pediatric unit of CHUB. The study was conducted from the 1st of June to the 30th of November 2015. The prevalence of nosocomial infections was 12.10%. This figure is very high comparing with studies done elsewhere. A multicenter study done in Europe in 2000 found that the average incidence of hospital acquired infection was 2.50%.[8]

Another study done in an Iranian referral hospital found an overall incidence of HAIs of 3.34%.[9]

Months which had a high incidence of HAIs were June-July (13.4% and 20%) and October-November (11.11% and 15.78 %). August and September had a low rate of HAIs with 6.17% and 8.41% respectively. The decrease of HAIs in August and September may be due to the absence of medical school students who are in holiday at that period and this may be supported by the increase of HAIs in October and November where medical students are back from holiday. Suchitra JB. Et al., (2007) reported that 27% of health care students had insufficient knowledge about infection control.[10]

This study showed that 46.55% of HAIs were LRI, 36.2% were BSI and 17.24% were UTI. Some previous studies found that LRI was the most common site of infection (9, 11%) while others found BSI as the most frequent HAI.[11–14]

The high prevalence of LRI and BSI hospital acquired infections at CHUB pediatrics patients could be explained by the high frequency of use of Nasogastric tube (NGT) and Peripheral venous Catheter (PVC). NGT and PVC are considered independent risk factors for HAIs.[15–17]

More than the half (51.66 %) of all cases of HAIs in pediatric patients were caused by *Klebsialla pneumonia*, followed by *Escherichia coli* (20%) and *Staphylococcus aureus* (18.33%). A previous study reported that *Klebsiella pneumoniae*, accounts for a significant proportion of hospital-acquired urinary tract infections, pneumonia, septicemias, and soft tissue infections. It was ranked among the most important cause of hospital acquired infections because of their incidence of 5% to 7% of all HAIs.[18]

Among all cases of HAIs due to *Klebsialla pneumonia*, 80.64% were for LRI, 12.90% for BSI and 6.41% for UTI. Among all LRI caused by NIs, 92.59 were *Klebsiella pneumonia*. Anton Y. P. and David C. H. (2010), found that Hospital-acquired pneumonia is the most common

life-threatening hospital-acquired infection, and the majority of cases were associated with mechanical ventilation. They also reported that Gram-negative were the predominate organisms in hospital-acquired pneumonia.[19]

For HAIs caused by *Escherichia coli,* 50% were BSI and 50% UTI and for *Staphylococcus aureus*, 81.81% were BSI, LRI (9.09%) and UTI (9.09%) (See Table 3). A previous study showed that the most five predominant bacterial species in HAIs are *Escherichia coli* (13·7%), *Staphylococcus aureus* (11·2%), Enterococci (10·7%), *Pseudomonas aeruginosa* (10·1%), and coagulase-negative staphylococci (9·7%).[20]

Another study in USA showed that *E. coli* was the most common etiologic Gram-negative organism of hospital-acquired urinary tract infections, followed in descending order of frequency by *P. aeruginosa*, klebsiella species, enterobacter species, and *A. baumannii,* klebsiella species, *Escherichia coli*, enterobacter species, and *P. aeruginosa* were reported as the most common Gram negative organism in Nosocomial BSIs.[19]

A study done in USA found that Gram-positive organisms caused 65% of hospital acquired BSIs and the most-common organisms causing nosocomial BSIs were coagulase-negative staphylococci (CoNS) (31% of isolates), *Staphylococcus aureus* (20%), enterococci (9%), and *Candida* species (9%).[21]

In this study coagulase-negative staphylococci were considered as contaminants.

Conclusion and recommendations

The present study showed that the prevalence of hospital acquired infection was very high (12.1%) and the main bacteria causing HAIs in pediatric unit were *Kleblesiela pneumonia*, followed by *E. coli* and *Staphylococcus aureus*. Nosocomial Low Respiratory Infections were the most prevalent. These data can be used as a baseline for effective and sustainable infection control measures at Butare University Teaching Hospital.

Authors' contribution

The PI has participated in every part of this study. Authors from Butare University teaching hospital (CHUB) have participated in sample collection and analysis of results. The author from the college of science and technology has participated in analysis of results and paper writing.

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Microbiological Quality of Lactuca sativa (Lettuce) Salad Vegetables Sold in Restaurants in Kigali, Rwanda

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Abstract

Background
Salad which is served at restaurants in uncooked form can be source of bacterial contamination.
Aim
To assess the microbiological quality of lettuce (*Lactuca sativa*) salads sold in two restaurants in Kigali, Rwanda.
Methods
Lettuce samples were collected using aseptic techniques and immediately analysed using standard media for *E. coli, Salmonella, Shigella and Staphyloccocus aureus* besides total aerobic count.
Results
The number of total aerobic bacteria ranged from 1.15 $x10^4$ to 2.87$x10^4$ cfu/ml for restaurant 1 and from 1.91$x10^4$ to 2.13$x10^5$cfu/ml for restaurant 2. *Staphyloccoci* count ranged from 3.6$x10^2$ to 1.173$x10^3$ cfu/ml for restaurant 1 and from 1.9 $x10^2$ to 3.2 $x10^2$ cfu/ml for restaurant 2. Gram negative bacteria count ranged from 8.3 $x10^2$ to 1.03 $x10^5$ cfu/ml for restaurant 1 and from 5.05 $x10^2$ to 2.30 $x10^5$ cfu/ml for restaurant 2. *Salmonella and Shigella* count ranged from 2.54$x10^3$ to 2.04$x10^4$ cfu/ml for restaurant 1 and from 3.65$x10^3$ to 2.5$x10^4$ cfu/ml for restaurant 2. *E. coli* was found in 75% of the sample from restaurant 1 and 100% of the sample from restaurant 2.
Conclusion: Improvement in hygiene is needed during preparation and handling of lettuce salad in these restaurants.

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Key words: Lactuca sativa, microbiological quality, restaurants, Rwanda

Background

Salad vegetables are served as one of the buffet composition in Rwandan restaurants. They are generally eaten raw or partially cooked. They become source of foodborne illnesses if not cleaned properly. Vegetables can become contaminated while growing or during harvesting, postharvest handling, or distribution.[1,2] The most common bacterial enteropathogens associated with fruits and vegetables are enteric pathogens such as *Escherichia coli* [3–5] and *Salmonella spp.*[4,5] *Staphylococcus aureus* is also a potential pathogenic agent that can cause salad contamination.[6]
Epidemiological and laboratory evidence points to *Salmonella enteritidis* as the cause of gastroenteritis following the consumption of food at a school function. [7] An outbreak of Escherichia coli due to contaminated lettuce has been reported in the USA in 2011.[8] Contamination of ready-to-eat salads with *Clostridium difficile* was reported in Scotland.[9]

Vegetables are contaminated with microorganisms when they are irrigated with contaminated sewage water and when the soil is fertilized with contaminated manure [10] Green salad leaves are attracting growing international concern as a potential source of foodborne pathogens, not only in domestic markets, but also in international trade. Vegetables such as lettuce and spinach are vulnerable to contamination at many stages in the food supply chain, but it is contamination in the field that is most worrying, mainly because the options for subsequent decontamination of green salad leaves are so limited.[11] The aim of this study was to assess microbiological quality of lettuce salad vegetables sold in two selected restaurants of Kigali City, Rwanda.

Methods

This study was conducted in Kigali City, Rwanda. Once a week samples of lettuce salad vegetables were collected from two most popular restaurants in town at lunch time. Samples consisted of ready-to-eat mixed salad taken in a sterile take away box. They were immediately transported to the microbiology laboratory of the College of Science and Technology, University of Rwanda, where microbiological analysis was done the same day.

Sample preparation
Each sample provided 10 g of vegetable material, which was homogenized in 90 ml of peptone water. This suspension was serially diluted in peptone water.

Microbiological analysis
Isolation
Gram negative bacteria were detected by culturing the sample on MacConkey culture media. *Staphyloccocus aureus* was isolated on Mannitol Salt Agar (MSA). Total aerobic bacteria were cultured on Nutrient agar media permitting the growth of gram positive and gram negative bacteria. Colonies were counted using a colony counter. *Salmonella* and *Shigella* were isolated on *Salmonella shigela* SS agar media.

Identification of bacteria

Gram staining
Some colonies were picked from culture media and spread on slide to make a smear which was dried, fixed and then colored using crystal violet for 1 minute, washed to remove it then alcohol was putted for 30 seconds and safranin for 1 minute which colors in red; then the slide was dried and observed under microscope using immersion oil. Gram positive bacteria were colored in violet/dark blue while gram positive bacteria were colored in red/pink.

Biochemical tests
After isolation of bacteria into nutrient agar, MacConkey agar , Mannitol Salt agar and *Salmonella Shigella* agar, pure colonies were picked and cultured on identification media. Simmons citrate was used to differentiate the Enterobacteriaceae. Catalase test was used for presumptive differentiation of streptococci (catalase negative), staphylococci (catalase positive), and listeria (catalase positive) from beta hemolytic streptococci. Coagulase test was used to differentiate *Staphylococcus aureus* from *Staphylococcus epidermidis* as well as streptococcus organisms. Coagulation within 24 hours was indicative of *Staphylococcus aureus.* The triple sugar iron test was performed on a pure culture of the organism obtained from the isolation media and inoculated in the tubes and then incubatedd at 35°C for 18-24 hours, after what tubes were read for acid production of slant/butt, gas, and hydrogen sulfide reactions. Methyl red test was performed on pure colonies from different Petri dishes: MacConkey, SS agar, nutrient agar and mannitol salt agar were picked and inoculated into MR-VP medium and incubated at 37ºC for 24h, then drops of methyl red solution were added to see the change of color. Urea test was performed on colonies from each kind of Petri dishes: nutrient agar, MacConkey, MSA, and SS agar were picked and inoculated into urea broth medium and incubated at 37ºC for 24h. This test is done to determine a bacteria's ability to hydrolyze urea to make ammonia using the enzyme urease.

Statistical analysis
Analysis was made on Microsoft Excel software version 2007 to calculate the percentage of samples which were contaminated with bacteria in both restaurants.

Results

The counts for total aerobic bacteria, Staphyloccoci, gram negative bacteria and Salmonella shigella during the period of one month are shown in Table 1.

Table 1. Microbial quality of lettuce salad vegetables on different media during a period of one month

Restaurant	Period	Total aerobic bacteria cfu/ml	Staphyloccocus aureus cfu/ml	Gram negative bacteria cfu/ml	Salmonella Shigella cfu/ml
		Nutrient agar	MSA	Mac Conkey agar	Salmonella Shigella agar
Restaurant 1	Week 1	$2.87x10^4$	$3.6x10^2$	$1.03x10^5$	$2.04x10^4$
	Week 2	$1.15x10^4$	$1.173x10^3$	$8.3x10^2$	$2.54x10^3$
	Week 3	$1.73x10^4$	$4.85x10^2$	$1.59x10^3$	$1.73x10^4$
	Week 4	$2.46x10^4$	$9.35x10^2$	$2.20x10^3$	$2.73x10^3$
Restaurant 2	Week 1	$2.13x10^5$	$2.9x10^2$	$2.30x10^5$	$2.5x10^4$
	Week 2	$2.84x10^3$	$1.9x10^2$	$1,15x10^3$	$3.65x10^3$
	Week 3	$1.91x10^4$	$3.2x10^2$	$1.03x10^4$	$1.18x10^4$
	Week 4	$2.20x10^4$	$2.45x10^2$	$5.05x10^2$	$1.93x10^4$

Microbial quality of salads vegetables according to PHLS guidelines

The microbial quality of salads was classified into satisfactory, acceptable, unsatisfactory and unacceptable category following the microbial count.

E. coli was found in the percentage of 75% for restaurant 1 and 100% for restaurant 2. *Staphyloccocus aureus* was found in the percentage of 100% for restaurant 1 and 75% for restaurant 2. *Salmonella* was found with the prevalence of 50% for restaurant 1 and the prevalence of 50% for restaurant 2. *Shigella* was found with the prevalence of 25 % for restaurant 1 and 25 % for restaurant 2.

According to PHLS guidelines salads from restaurant 1 and restaurant 2 were satisfactory for the criterion of aerobic colony count. For indicator organisms *E. coli,* three samples were unsatisfactory in both restaurants and one sample was unacceptable in both restaurants. For pathogens organisms: *Staphyloccocus aureus* was in an acceptable range for both restaurant 1 and 2. For *Salmonella* criterion two samples of restaurant 1 were unacceptable and two were satisfactory for both restaurants. For *Shigella* criterion one sample was unacceptable for both restaurants and three samples were satisfactory.

Discussion

The results obtained in this study testify that minimally processed vegetable salads have potential contamination by foodborne pathogens. According to PHLS guidelines Staphyloccocus aureus was in an acceptable range for both restaurant 1 and 2. Its presence may be an indication of human contact.

However the presence of Salmonella in two samples of lettuce salads and shigella in one sample for both restaurants shows that they can be an important vector for the transmission of pathogenic bacteria to consumers. The contamination level of lettuce, compared to other type of vegetable, is due to its small size which promotes the deposition of soil bacteria and manure under the effect of watering or other mechanisms.

The presence of *E. coli* in foods is an indicator of direct or indirect fecal contamination. It is also an indicator of the possible presence of enteric pathogens.

Presence of pathogenic agents on lettuce indicates that the wash procedure was inefficient either due to the inappropriate wash medium or wash time.[12,13] Cross-contamination through food handling has also been reported when utensils are not sufficiently cleaned and are used for different types of foods.[14] However bacterial internalization in vegetable leaves has been reported for lettuce, which makes disinfection inefficient.[11,15]

Conclusion

Lettuce salad vegetables served in some restaurants of Kigali may harbour some pathogens which cause diseases. According to the results some samples were safe but others unsafe. It is advised to implement strategies which include an improvement in the preparation and handling of salads before and after their preparation.

Recommendation

The owner of restaurants should improve their hygiene during the preparation of their food by a proper cleaning of the materials, good wash of salads before preparing, and add some amount of vinegar.

Only two restaurants were investigated; further investigation is warranted to have a global situation on the food hygiene of Rwandan restaurants.

Author's Contribution

CU designed the study, collected the samples, carried out the laboratory tests and data analysis and wrote the manuscript.

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Disclosure statement

There is no financial conflict of interest.

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Synchronization of Patient Data Among Health Facilities Through Electronic Medical Records System: A Case Study of Kabgayi District Hospital

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Abstract

Background
The use of modern technology in healthcare system aims to increase the reliability, accessibility and productivity of delivered services. In most developing countries, particularly in sub-Saharan Africa, Electronic Medical Records (EMRs) has been dominated by paper-based system. In Rwanda, EMRs started in 2011 with a baseline of 8% and reached 50% in 2017 within 516 health facilities, but patient data synchronization among health facilities is still a problem. The aim of this research was to identify factors hindering EMRs implementation and propose applied solutions.
Methods
A cross-sectional descriptive study design with qualitative and quantitative approach was used. A purposive method to select the research participants among the target population was also used.
Results
It was found that, despite the improvement of hospitals' management and healthcare efficiency via EMRs system, factors affecting synchronization of patients' data among health facilities still persist. The study also revealed the need for the interoperability in the integration of EMRs system among health facilities.
Conclusion
The OpenMRS EMR-based data synchronization can reduce gaps in HIV care. It avoids a duplication of patient identification number (PID) at the same health facility for more than one visit and missing data among health facilities. As part of implementable solutions for effective service delivery, cloud-based server and patient identification were suggested as solutions for much more success in Open MRS EMRs system.
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Keywords: Electronic Medical Record, Data synchronization, Cloud computing technology

Introduction

The use of modern information technology in healthcare delivery aims to increasing the reliability, accessibility and productivity.[1] The implementation of Electronic Medical Record (EMR) can be traced back over few decades, and it has improved the effectiveness of service delivery in health sector. [2] In most developing technology, the package of modules that are required by an EMR system include patient registration, diagnostic imaging reports, scheduling an appointment, writing prescriptions, documenting patient encounters, requisitioning, documents management, and receiving laboratory and managing interoffice communications, clinical decision support, and billing.[3] The advantages of using EMR system are that it can support clinical research, decision for drug ordering, and management of diseases like diabetes, heart failure and tuberculosis. EMRs constitute an easily simplified information communication between multiple locations such as laboratory to physician.[4] Like other countries, Rwanda has been implementing Electronic Medical Record (EMR) system as a strategic plan in e-health. [5] It is in this regard that the aim of this research paper is to identify factors affecting the process of synchronizing, storing and retrieving all patients' information through the EMR system but, still now the Open Medical Record System (OpenMRS) distributed by the Ministry of Health (MoH) does not enable to synchronize patients' medical records, that means the patients requesting services from the health facility can receive multiple patient identification codes (PID) in more than one visit

while the open MRS is web based system to be accessible online. Considering that 93.8% of health care facilities in Rwanda have been connected to internet,[6] the researchers ware keen on investigating why the health facilities in Rwanda are not able to sharing the patients' information using an Open MRS Electronic Medical Record as system.

As a consequence, we noticed limited interoperability of government systems where many health facilities work in isolation and the EMR system used in some health facilities still provide a multiple patient identification (PID) numbers in one or many health facilities, and they are still relying on paper based system.[2] There is a strong need to investigate on the synchronization of patient data among health facilities through Electronic Medical Records system in Rwanda; no such research, however, has been described in Rwandan health literature. Therefore, the purpose of this research was to identify factors impeding the implementation of the Open MRS, and propose implementable solutions leading to smooth operationalization of patients' data synchronization between health facilities.

Methods

This research was cross sectional quantitative and qualitative study at Kabgayi district Hospital and sixteen health centres under Kabgayi Hospital supervision, in Muhanga District, Southern province, Rwanda. The study area was selected purposively. Purposive selection of the area was due to their perceived knowledge and involvement in Open MRS EMR system. Researchers selected ARV/ HIV Department and health centres staff because they have successfully implemented Open MRS (EMRs) in ARV/HIV service.

As for the sample of the target population, due to low number of participants, purposive sampling was used to select 42 participants at the study site including EMR IT manager, Medical specialist, Nurses, Data managers and Titular of the health centres participating in the study.

Regarding data collection tool for this study, a three-part structured questionnaire adapted and modified from Msukwa[7] was used. In addition, meetings were arranged to meet with the Open MRS users and explain to them the purpose, goals and implementation of this research study. All interviews were conducted from participants' work place and they were in English as respondents were able to use it. Thus, after informational meetings with participants in research, written informed consent with participants' signatures were obtained. Then, the researchers collected information from EMR IT managers, Medical specialist and Nurses who were purposively selected.

A pre-test of the questionnaire was given to the EMR-IT managers, Medical specialist and Nurse in order to check the validity of questions in the Rwandan context. The questionnaire was administered as researchers-assisted instrument. The data collection was achieved using questionnaire with closed-ended and a few open-ended questions. Data were coded in SPSS version 21.0 for quantitative analysis.

For the qualitative data, it was collected thorough in-depth interview with four key informants including the EMR IT manager, the ICT Officer, the Titular of the Health Centre and a Medical Specialist. These keys informants were selected because they were the heads of the services and system administrators who always access Open MRS system. The researchers requested for and were granted permission from all study participants to audio record the interview in order to facilitate accurate data acquisition and its analysis. Transcription of each interview recording was completed at the end of each interview day. For the data collection tool, it was accomplished by using a fishbone diagram or Ishikawa diagram invented by Kaoru Ishikawa[8] and analysed using the root cause and effects diagram to categorize the potential causes of the problem of the synchronization of patient data through Open MRS and solutions were proposed based on the factors.[7–10] Analysis was accomplished by initially identifying the main themes which were interpreted to examine the meaning of the words spoken and actions elicited.

Validity of the data analysis was enhanced by continuous assessment of interview transcripts, frequently replaying of the recording, and reviewing thoroughly the field notes. Commonly, the researchers utilized debriefing session after the interview process to help increase validity and continuity. As for key issues on ethical considerations, the study participants were allowed to withdraw at any time during the interview process without fear of consequences, as their participation in this study was entirely voluntary in nature. The identity of the participants was kept anonymous and the records were securely stored in locked storage cabinets to ensure confidentiality. Still on ethical matters, the researchers received three ethical clearances respectively from the Ministry of Health (MoH), the National Health Research Committee (NHRC) and Institutional Review Board of the University of Rwanda/ College of Medicine and Health Sciences (IRB).

Results

Demographic characteristics of the participants

A total of 42 questionnaires were distributed with response rate of 39 (93%). The minimum age group was 26-30 years while the maximum age group was 30-35. All this was calculated as grouped in data in SPSS 21.0 since that is how it was collected. The majority of the participants 16 (41.0%) were age group 30-35 years or younger. As for the gender of the respondents, females were 24 (61.5%) versus 15 males (38.5%). Data entry clerk represented the largest percentage of respondents at 20 (51.3%) compared to all other professionals namely clinician, nurses, medical specialist, social assistant,

EMR-IT manager and supervisors. Nineteen (48.7%) participants had more than two years of working experience using EMR (Open MRS). Table 1 shows a summary of the demographic information of the study.

Table 1. Participants' demographic information (n=39)

Variables	Characteristics	Frequency	%
Age (years)	26-30	4	10.3
	30-35	16	410
	36-40	13	33.3
	41^{+}	6	15.5
Gender	Male	15	385
	Famle	24	61.5
Work position	Nurse	9	30.0
	Clinician	1	2.6
	Data entry clerk	20	51.3
	Medical specialist	1	2.6
	EMR_IT manager	1	2.6
	Supervisor	6	15.5
	Social assistant	1	2.6
Working experience (months)	13-18	9	23.1
	18-24	16	41.0
	24^{+}	14	35.9

Perception of the participants towards the efficiency of the Open MRS Versus paper-based system recording

Common factors identified in the study of evaluating the user's perception on the synchronization of patient data using Open MRS EMR and paper-based medical records consisted of the speed of results and experience, implementation and period of using a paper-based system in sharing patient data, the period of using Open MRS EMR, accuracy and effectiveness of records, which increased patient confidentiality and enhanced faster data sharing. The findings of this study showed a positive impact on the perception on the synchronization of Open MRS EMR by the study participants as compared to using paper-based medical records.

The experience and perceptions of the participants towards the efficiency of the Open MRS Versus paper-based system recording are shown in table 2. By comparing the accuracy and effectiveness of data in both systems, 31 (79.5%) declared Open MRS EMR more accurate and effective to use while 8 (20.5%) voted the paper-based records. The participants also compared the confidentiality of Open MRS EMR and paper-based record to use where 33 (84.6%) preferred to use Open MRS EMR versus 3 (7.7%) who preferred paper-based medical records and 3 (7.7%) preferred to use both systems. Regarding the speed of both systems while sharing data, 36 respondents (92.3%) viewed Open MRS as faster in data sharing.

Table 2. Perception of the participants towards the efficiency of the Open MRS Versus paper-based system recording (n=39)

Variable	Characteristics	Number of respondents	%
Paper-based medical records before	Yes	39	100
If yes, how long period using paper-based medical records (months)	6-12	2	5.1
	13-18	9	23.1
	19-24	13	33.3
	24+	15	38.5
How long using EMR (OpenMRS)	6-12	7	17
	13-18	11	28.2
	19-24	17	43.6
	24+	4	10.3
Accurate and effective	EMR (Open MRS)	31	79.5
	Paper-based	8	20.5
Confidentiality	EMR (Open MRS)	33	84.6
	Paper-based	3	7.7
	Both	3	7.7
Faster in data sharing	EMR(Open MRS)	36	92.3
	Paper-based medical	3	7.7

The qualitative results showed that the majority of the participants articulated a positive experience concerning the efficiency of the Open MRS EMR. All the participants reported that Open MRS EMR enhanced work performance in the different tasks of the services. For example,

"Using Open MRS EMR, we do not have to go into warehouse to look for patient files which take long time to find; just now search in the computer and all the information concerning patients appears on the monitor" P#2

"*We can consult and receive many patients in a short period of time"* P#1

"Patient data are recorded on a Patient Health Record encounter form, eliminating duplicate documentation in multiple clinic logbooks" P#3

Factors affecting the patients' data synchronization between district hospital and health centres.

By using a root-cause analysis technique regarding the factors affecting synchronization of patients' data among health facilities as shown by the respondents, they were grouped into 6 categories namely people (staff), materials and equipment, technology, standards, working environment, and innovation.

The impact of each factor on using EMR is highlighted in figure 1.

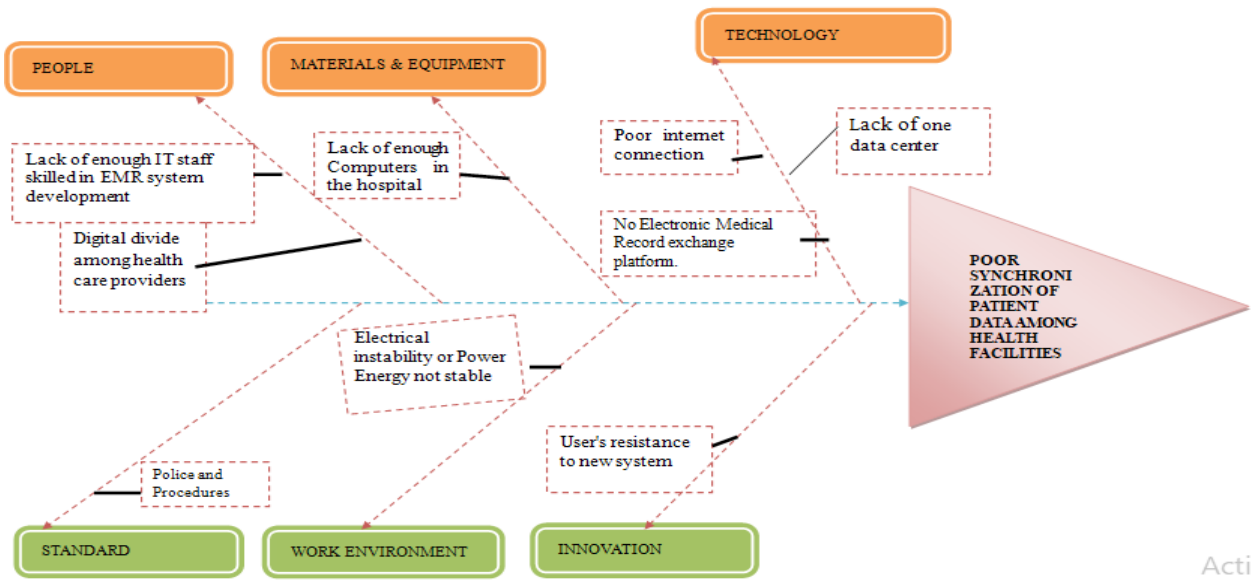

Figure 1. Factors leading to poor synchronization of the patients' data among the health facilities through the use of EMRs

The researchers further evaluated respondents on factors affecting the patients' data synchronization between district hospital and health centres. From the interviews' responses, most of the participants reported that the lack of competences in IT skills, power cut-offs, lack of computers and IT managers in some health facilities as main factors to impede the EMRs implementation. Quoted from their interview, "*The lack of staff with IT skills related to EMR system development and deployment is a big challenge*" **P#2***"*

A lower number of computers in the hospital services is a hindrance to effective use of the EMR system" **P#4**

"The main challenges is the electrical system at the facilities. They are either outdated and need to be refurbished or they are not up to standard. This results in networking equipment damage or malfunction." While some exclaimed " Technology cannot be efficient without electricity, when there is no electricity we cannot do anything." **P#1**

Still on the issue of facilities while using EMR system, the key informants further expressed their views: "very few health centers lacked computers and IT manager to accommodate computers" **P#4**

Problems of sychronization of patient's data and incomplete data entry, low reporting by CHWs in some health centers were also identified as challenges. On the qualitatitve interviews the respondent reported : *"If the system requires maintenance often they would have to wait for only one EMR-IT Manager from district hospital that serves more than one health centers" "Another option is to approach private workers at an increased cost"* P#1

A study conducted in 2007, reported that a challenge in using an EMR in developing country setting is that data synchronization where the sites need local copies of data repository and handle unreliable internet connectivity meanwhile data from all sites need to be combined in a central repository to allow tracking of transferred patients to another facility. The results shows that for synchronized patient data a tool is required to synchronize data and handle data entry conflicts, by allowing seamless use of local Open MRS servers and replicated data by providing offline access to a parent Open MRS repository.[11]

Perception of the respondents for an implementable solution of the synchronization of patient data through the Open MRS EMR system

The findings of the study in the table 3 indicated the perception of the respondents in handling the issue of the Open MRS EMR synchronization for implementable solutions. All 39 (100%) of the respondents agreed on synchronized Open MRS EMR data in the level of the department considering the perceived quality of care and decision making that had improved a hundred percent since the introduction of Open MRS EMR. Although these findings show total agreement of using Open MRS EMR, the respondents reported that the servers of the Open MRS EMR were not interconnected to another health facility. All 39 (100%) of the respondents indicated that EMR system generate one unique identifier for each patient in users of the system. In this regard, the respondents indicated the methods used to synchronize the patients records: 27 (69.2%) of the respondents used paper-based records and 6 (15.4%) of the respondents used an email attachment for synchronization of the patient records, while 6 (15.4%) of the respondents synchronized patient records by used USB flash driver. Still on the issue of data synchronization, 35 (89.7%) of the respondents said that Open MRS EMR had the ability to synchronize the patients records among two health facilities while 4 (10.3%) of the respondents reported that Open MRS EMR hadn't any ability to synchronize the patient's records. Thirty-three (84.6%) of the respondents were challenged with the access of the previous patient records when they receive a patient from other health facilities while 6 (15.4%) of the respondents were challenged to use different patient identifier (PID). Looking at the techniques used to share the patient information obtained in the Open MRS from other facilities, 14 (35.9%) of the respondents used USB flash driver, and 5 (12.8%) of the respondents used email attachment, while 20 (51.3%) of the respondents used the printed paper based. As for the types of network use in EMR data sharing, 14 (35.4%) of the respondents used modem connection while 25 (64.6%) used an internet from cable connection. For the appropriate security network proposed in the sharing of the Open MRS EMR, after being explained the importance of two types of security networks, 15 (38.5%) of the respondents preferred to use virtual private network while 21 (53.8%) opted cloud server network in the EMR data sharing. On the issue of backing up data once needed, the findings indicated that 27(69.2%) of the respondents showed it was easy for them to make EMR backup when using Open MRS, while 11 (28.2%) of the respondents had difficulties to make EMR backup. All 39 (100%) of the respondents said that EMR data sharing help the provider to do the follow-up to the patient records although they all reported having a problem of policies and procedures to synchronize patient data electronically among two health facilities.

Table 3. Perception of the respondents for an implementable solution of the synchronization of patient data through the Open MRS EMR system (n=39)

Variable	Characteristics	Number of respondents	%
Paper-based medical records before	Yes	39	100.0
Sharing EMR data helps you in decision making	Yes	39	100.0
EMR local server in your catchment is interconnected to other facilities?	No	39	100.0
EMR server system in your facility generates one unique identifier?	Yes	39	100.0
Which methods used to synchronize The patient's record?	Paper based record	27	69.2
	Email attachment	6	15.4
	USB flash driver	6	15.4
EMR has the ability to synchronize the Patients records among two facilities	Yes	35	89.7
	No	4	10.3
What challenges to EMRs when you receive Patients from other facilities?	Previous records	33	84.6
	Different unique identifier	6	15.4
Which techniques use to share the information obtained from EMRs at other facilities?	USB flash driver	14	39
	Email attachment	5	12.8
	Printed paper based	20	51.3
Which type of network used in EMR data sharing	Modem connection	14	35.9
	Internet cable	25	64.1
Easy to make backup in your facility or hospital?	Yes	27	69.2
	No	11	28.2
EMR data sharing helps you to do follow up of patient records?	Yes	39	100.0
Do you have policies and procedures to synchronize patient data electronically Among health facilities?	No	39	100.0

The qualitative results showed that the participants expressed negative causes and effects regarding the efficiency of the synchronization of Open MRS EMR. All participants reported that Open MRS EMR were managed in local server (level of health facility). For example:
"The servers of EMRs are managed within each facility while Open MRS was designed as web-based system that means the patients requesting a service at a health facility can receive multiple patient identification code (PID) in more than one visit while the Open MRS EMR is a web-based system to be accessible online" **P#3.**

Most of the participants indicated that frequent power cut posed a challenge in using the Open MRS EMR system that was affecting synchronization of patient data with different location. In one of their views *"The main challenges is the electrical system at the facilities. They are either outdated and need to be refurbished or they are not up to standard. This results in networking equipment damage or malfunction." While some exclaimed " Technology cannot be efficient without electricity, when there is no electricity we cannot do anything."* P#4

The researchers further evaluated other factors affecting synchronization of Open MRS EMR, through the respondents parceptions related to the implementable solution of EMR in the in-depth interviews. Most of the participants reported that there was a cause that affects the synchronization after the deployment of the Open MRS EMR.*"Lack of enough IT staff skilled in EMR system development for the low number of skilled staffs in the system analysis and development and low level of end user input during system design"* P#2 and P#3
"Security, privacy and confidentiality of patient records are more sensitive in data sharing that needs enough confidentiality" P#1
"Digital divide among healthcare providers where some doctors and nurses don't have enough skills in ICT and also lack of a regular and structured EMR training program for end users" P#4
"Some health facilities are not connected to fiber, usually they use modem and also insufficient infrastructure" P**#3**

Discussion

Demographic characteristics

Research results showed that the majority of the participants 16 (41%) were in the range of 30-35-years-old; 13 (33.3%) were 36-40-years-old; 6 (15.4%) were 41-years-old and above, and 4 (10.3%) were 26-30 years old and less. Literature shows older people have fewer positive attitudes and greater nervousness than young counterparts towards EMRs and it also shows more resistance to newer technologies than the young people.[12] In the current study, participants aged below 40 years; 29 (74.3%) were more engaged to use Open MRS EMR system in every day work compared to those who were above 40 years old more likely to mix both recording systems.

Perception of the participants towards the efficiency of the Open MRS versus paper-based system

The Open MRS system was implemented in the Rwandan healthcare sector since 2006 and since then has improved in facilitating clinic services including easy reporting tools, maintaining the privacy of patient's information, easy correction of mistakes, adding some information easily, keeping safely the patient's health information and improving care to the patient[11] with a focus on implementation of Open MRS EMR. As the result of implementing electronic health records in 2 East African countries namely Tanzania, Uganda and also in northern Nigeria, the literature indicates that use of Open MRS is supporting in maternal and reproductive health as well as in improvement of HIV/AIDS care in the countries stated above.[13] In the evaluation literature, a health information system is one of essential building blocks in the healthcare system. An EMR as a part of HIS should provide a reliable and timely information to help in evidence-based decision making at all levels of the healthcare system. The main emphasis is on how clinical performance change.[14]

Open MRS EMR has proven to be efficient and effective worldwide. A perception on synchronization of patient's data among health facilities through electronic medical records system has validated and supported the increased efficacy and accuracy of the medical records as compared to a paper-based records system in Rwandan health sector. The age of respondents showed younger participants perceived that the Open MRS EMR was faster in data sharing with 36 (92.3%), accurate and effective with 31 (79.5%), and more confidentiality with 33 (84.6%) in using EMR than a paper-based record system. The findings on the qualitative interview with respondents demonstrated that a perception on synchronization of patient data using Open MRS EMR system had in fact reduced issues of increased waiting time, increased the efficiency of medical record keeping and transporting, and helped facilitate accurate billing. Responses included "The is no more loss of patients' files at each level of the facilities and highlighted the burden of patient information management in low resource environments" P#1, P#3**.** The current study of the implementation of Open MRS EMR is supported by Sahay study conducted in 2016 and Akanbi study conducted in 2011. These studies reported on 'Big Data and Public Health : Challenges and Opportunities for Low and Middle Income' and on 'Use of Electronic Health Records in sub-Saharan Africa : Progress and challenges'.[15,16] This research study of the synchronization of the Open MRS EMR system will contribute not only to improve the efficiency but also the quality of healthcare in Rwanda.

Perception of the respondents for an implementable solution to synchronize patient data through the Open MRS EMR system

Open MRS EMR has been adopted in different departments in different countries and highlighted the burden of patient information management in low resource environments. Rwanda Health Information Exchange (RHIE) is an example of system for aggregating health information consistently and promote the information reuse by patients, providers and decision makers.[15] Synchronization of patient data using Open MRS EMR has improved the quality of care in Kabgayi hospital as reported by 39 (100%) of the participants in the current study. Thirty-nine percent of the participants reported that Open MRS EMR local server is not interconnected to other facilities, and, as a consequence, this affected the sharing of patient data within two or more health facilities. The literature indicates that the problem of interconnectivity of the IT department in Jordan hospital is generally due to lack of Information and Communication Technology (ICT) infrastructure, that could affect a successful implementation of nationwide e-health program.[17]

The current study, as shown by thirty-nine percent of the participants (100 %) indicates that EMR server system within the hospital catchment area, generates one patient unique identifier (PUI) for the better privacy and patient data security. This is in conformity with the other literature study indicating that in patient data act law with the logs actively monitored to avoid any unlicensed accesses to patient medical data.[18] The key informants further expressed negative changes on the sharing patient data among two health facilities is seen with Open MRS EMR in the interview in which the servers of EMRs are managed into each facility while Open MRS were designed as web-based system that means when the patients requesting a service to health facility can be assigned multiple patient identification code (PID) in more than one visit P#3**.** In this study, it is shown that, when there is a need to synchronize the patient data between two health facilities, 27 (69.2%) used paper-based record, 6 (15.4%) shared by using email attachment and 6 (15.4%) used USB flash driver. The current study also indicates that 35 (89.7%) have the ability to synchronize patients records among two health facilities and 4(10.3%) indicates that EMR was not able to synchronize the patients' records.

Comparing these finding with other results in similar studies, a study in 2015 conducted in Kenya by Haskew reported that the implementation of a Cloud-Based Electronic Medical Records to reduce gaps in HIV treatment continuum in rural Kenya had enhanced data sharing at different levels of health care to inform clinical and public health decision-marking.[19] The total 2169 and 764 patient records had missing data pre-implementation and post implementation of EMR-based data verification and clinical decision support respectively. In the current study, the participants reported that a type of network uses in EMR data sharing 25 (64.1%) use the modem connection and 14 (35.9%) use internet cables in EMR data sharing. The study conducted in five sub-Saharan African countries showed that to make a patient follow-up, there is need to use modems and cellular networks where BHOMA clinics access the internet to securely synchronize records to a central server.[14] Similarly, in this current research study, most of the participants synchronized the patient data using Open MRS EMR system: 21 (53.8%) use cloud server network as an appropriate type of security network in EMR data sharing and 15 (38.5%) use virtual private network as an appropriate type of security network.

A study conducted on the Cloud Computing at National e-health services as the data centre solution architecture reported to the currently objective of the study by implementable solution of the synchronizing of the patient data through the EMR system, proposing building a national e-health cloud server to overcome many of the challenges confronting the success of Hakeem the core of the National e-Health System (NHS) for the provision of e-Health as a Service[17] with a focus on implementation solution of the Open MRS EMR system. Similarly, in the current research study, all of the participants (100%) reported that the EMR data sharing help them to do a follow up of patients and many of the participants, i.e. 27 (69.2%) indicated that it was easy for them to make a back-up, while 11 (28.2%) had difficulties to make a back-up. These findings are closely similar to the study conducted on the benefits and challenges of EMR implementations in low resource settings.[20]

The synchronization of the patient data using Open MRS EMR needs the policy and procedure as emphasized by respondents in the interview where the participants stated "the clinical coding systems and the integration of IT in healthcare system is a more complex process, the standards available for electronic health systems are called International Standard Organizational (ISO) like Logical Observation Identifiers Names and Codes (LOINC) standards, Health Level Seven (HL7) standards, Systematized Nomenclature of Medicine (SNOMED) standards and International Classification of Diseases (ICD-10) standards" . These views are compared with the research study Privacy and Data Security of Electronic Patient Records (EPR) Sharing. [18]

Conclusion

Open MRS EMR-based data synchronization can reduce gaps in HIV care, including duplication of patient identification number (PID), data missing and with promoting healthcare, increasing health information systems that facilitate communication by improving the quality of care. Cloud-based model of Open MRS EMR implementation eliminates the necessity for local hospital infrastructures and has the possibility to enhance data synchronization at different stages of healthcare to inform the healthcare professionals to share a decision-making. In addition, Open MRS EMRs data are shared successfully among health facilities by the system generating Patient Unique Identifier. To be more successful, there is a strong need to enhance IT skills for staff using EMRs system, improve electricity stability in health facilities, avail computers and reliable internet connectivity in order to allow technology help sharing Open MRS EMR among health facilities.

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Conflict of interest
All authors report no conflict of interest.

Authors' contribution
CN was responsible for the study conception, design, and data analysis. JPN, SFX, NK, TU and PCK contributed in searching literature to support the data analysis and discussion, NS contributed in reviewing comments while IH contributed to the drafting, proofreading as well as editing of the manuscript.

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Improving Starting Time in Operating Rooms of a Tertiary Hospital in Rwanda: A Quality Improvement Project

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Abstract

Background
Delay in the first surgery start time at operating room (OR) could inevitably decrease utilization, lose very expensive OR resources, reduce satisfaction of patients and staff and potentially affect quality of patient care.
Objectives
This study utilized the Strategic Problem Solving (SPS) quality improvement approach to increase the percentage of first surgeries started on time at a tertiary hospital in Rwanda.
Methods
A pre- and post-intervention study was conducted between March 2016 and March 2017. The intervention included developing a policy on staff arrival time, training sessions on the policy and regular supervision of OR managers to ensure staff were arriving on time.
Results
Chi square tests were performed to analyze the pre- and post-intervention results. The percentage of first surgeries started on time significantly increased from 3% pre-intervention to 25% post-intervention ($P<0.001$), average duration of delay decreased by 55 minutes ($P<0.001$) and the percentages of nurses, anesthetists and surgeon arrived on time also significantly increased ($P<0.001$).
Conclusion
The SPS approach can be useful in addressing the starting time of first surgery at OR. Support from the senior management team and buy-in from staff are essential. This project cannot eliminate confounding factors and the results cannot be generalizable to other settings. Longer term evaluation on sustainability is needed.
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Keywords: Delay first surgery, operating room efficiency, quality improvement, strategic problem solving

Introduction

As the demand and expectations of quality health care delivery continue to increase, the hospital running cost escalates simultaneously. There is a need for hospitals to maximize the use of operating room (OR) in order to contain the ever expanding operating cost.[1] The first surgery start time has been a focus of many quality improvement initiatives in hospital OR management to maximize utilization efficiency. [1-7] When the first scheduled procedure for the day is delayed, the subsequent surgeries will be delayed and in many cases, cancelled. This inevitably will decrease the number of cases that can be performed in a single day, causing loss of very expensive OR resources and affect the satisfaction of patients and staff.[2, 8]

Improving OR efficiency has been widely studied worldwide.[1, 8] Since the operation of ORs involves a multiplicity of disciplines, many contributing factors identified have been mostly related to improper planning - including shortage of staff, lack of team work, insufficient communication and lack of planning.[3–6] In 2011, a survey conducted in India on the common causes of delay in first surgery at the OR, only one out of the top ten causes of delay was related to patients' clinical condition; the other nine were all planning and management issues.[8]

Many initiatives have been implemented to improve the first surgeries starting time, from enhancing communication among OR team members, staff education, process re-engineering.[10–13] Among all the various quality improvement approaches like Total Quality Management (TQM), Six Sigma, Lean, the eight-step Strategic Problem Solving (SPS) is a framework that emphasizes on using data and evidence to identify

solutions to address problems in health care settings. [11] The SPS framework has been used in many health care organizations and the methodology has shown to be particularly effective in resource–limited settings. [12–16] The eight steps of SPS approach are: 1) defining the problem; 2) setting an objective; 3) conducting a root cause analysis; 4) generating alternative strategies; 5) comparing strategies; 6) selecting a strategy; 7) implementing the strategy; and 8) evaluating its impact on the problem.[17] This quality improvement project followed the SPS 8-step approach to address the delay in the starting of first surgeries in one of the referral hospitals in Kigali, Rwanda.

Methods

Setting and problem description

The study was conducted in the University Teaching Hospital of Kigali (CHUK), in Rwanda. The hospital has 560 beds and receives about 75% of all surgical referrals of the country.[18] The department of surgery has 18 surgeons, 5 anesthesiologists, 35 theater nurses, 28 non-physician anesthesia providers and 12 supporting staff working in the six operating rooms.[19] In 2015, 6706 operations were performed; translating to approximately 3.2 surgeries per room per day.[19]

The first surgeries for the ORs were scheduled to start at 8:30AM Mondays, Wednesdays and Fridays and at 8:00AM on Tuesdays and Thursdays. Mondays, Wednesdays and Fridays have later starting times because of morning staff meetings.[19] Staff are expected to arrive at the OR at the following times: 7:30AM for nurse, 7:45AM for anesthetists and 8:00AM for surgeons on Mondays, Wednesdays and Fridays; and at 7:15AM for nurse, 7:30AM for anesthetists and 7:45AM for surgeons on Tuesdays and Thursdays.

A project team which included nurses, anesthesia technicians and surgeons was formed. The baseline assessment showed only 3% of first surgeries had started as scheduled. By following the SPS approach, we formed a project team to collaboratively implement the project. The team first defined the problem statement as "the percentage of first surgeries started on time was low" and had set an objective of improving the percentage of first surgeries started on time to 90%. The team conducted a root cause analysis and found that many of the staff arrived at the OR later than the expected time and there was no written policy related to staff arrival time. Based on the findings, we selected and implemented an intervention to address the root cause.

Design

A pre- and post-intervention study was conducted to improve the percentage of first surgeries that started on time. The pre-intervention period baseline assessment was conducted from March to August 2016; all start time and scheduled time of the first surgeries of each day within that period were collected. The time of arrival of nurses, surgeons and anesthetists were also recorded. An intervention was implemented from September to November 2016. Post-intervention data was collected between December 2016 and March 2017.

Sample

All first elective surgeries of the day during the pre- and post-intervention data collection periods were included in our sample. Based on the monthly census, we estimated about 96 first elective surgeries would be included in each of the pre- and post-intervention samples. The scheduled time and surgery start time (first-cut) were extracted from the OR registration book. Emergency cases were excluded from the study as they were not scheduled.

Intervention

Our quality improvement project implemented a series of interventions to address the first case start on time. The intervention included three components. 1) Developing a policy on staff arrival time. The policy was developed in collaboration with the OR management team and the hospital human resources department in September 2016. 2) Providing training sessions on the policy. After the policy was approved by the hospital and OR department, training sessions on the new policy was set up to orient the staff. Multiple sessions were held to ensure all staff working at the OR was captured despite working in different shifts. The trainings were also repeated over a few weeks' time to ensure staffs who were on leave could attend at least one training session. The training was a one-hour session and it involved the details of the new policy, the potential disciplinary actions and the supervision mechanism to reinforce the policy. 3) Providing continuous supervision to enforce the policy. After the policy was developed and communicated to all OR staff, OR managers started conducting regular morning rounds to ensure staff were arriving on time.

Ethical considerations

The project was approved by the Institutional Review Board (IRB) of College of Medicine and Health Science (180/UR-CMHS-SHS/16) and IRB of CHUK (EC/CHUK/121/2016), as well as the hospital administration and the OR department management team.

Measures

Three indicators were collected to measure the effect of the intervention.

1) The percentage of first surgeries started on time. The start time was defined as the anesthesia induction time in this project. The surgery was considered started on time when the anesthesia induction time was conducted on or before the scheduled time.

2) The average duration of delay (Difference between anesthesia induction time and scheduled time in minutes).
3) The percentage of staff arrived on time (subdivided by nurses, surgeons and anesthetists). On-time arrival was defined as when the staff arrival time was on or before the time they are required to arrive at the OR.

Data analysis

Descriptive statistics were used to summarize the findings. Chi-square test was used to compare the pre- and post-intervention percentage of first surgery on time and percentage of staff arrived on time, and T-tests were used to compare the pre- and post-intervention average duration of surgery delay. All tests were conducted using SPSS v.21 software, with P–value set at 0.05.

Results

The start time of 96 first surgeries were collected in the six ORs in the pre-intervention period and 96 in the post-intervention period. The intervention significantly increased the percentage of first surgeries started on time from 3 (3%) pre-intervention to 26 (25%) post-intervention, with P<0.001 (Table 1). The average duration of delay was also significantly reduced from 86 minutes pre-intervention to 31 minutes post-intervention, with P<0.001 (Table 1). The percentage of anesthetists who arrived at OR on time increased from 16% pre-intervention to 51% post-intervention (P<0.001). The percentage of nurses who arrived at OR on time increased from 10% pre-intervention to 88% post-intervention (P<0.001). The percentage of surgeons arrived at OR on time increased from 30% pre-intervention to 57% post-intervention (P<0.001) (Table 1).

Table1. Table summarizing the pre- and post-intervention results

Indicators			Pre intervention	Post intervention	Change	P value
Sample size (N)			96	96	-	-
Surgeries started on time n (%)		Yes	3 (3%)	26 (27%)	24%	<0.001
		No	93 (97%)	70 (73%)		
Average duration of delay (Minutes)			86	31	55	<0.001
Staff who arrived on time	Anaesthetists	Yes	16 (17%)	49 (51%)	35%	<0.001
		No	80 (83%)	47 (49%)		
	Nurse	Yes	10 (10%)	84 (88%)	78%	<0.001
		No	86 (90%)	12 (13%)		
	Surgeon	Yes	29 (30%)	55 (57%)	27%	<0.001
		No	67 (70%)	41 (43%)		

Discussion

Healthcare costs are escalating worldwide.[2,20] Quality improvement projects can help reductions in costs in health care delivery while increasing quality.[9] This quality improvement project was designed to reduce delays in starting time in OR at CHUK referral hospital, Kigali. By following the SPS approach, a project team was formed to tackle the issue. The team first identified the problem statement, set objective and conducted a root cause analysis. The OR day-to-day operation involves multiple professional groups and complex work processes. When conducting quality improvement projects in OR, the project team could easily be overwhelmed and distracted by the numerous and convoluted existing problems exist in the OR. By clearly defining the problem statement, the project team was able to focus to address a single issue rather than being distracted by the overwhelming number of problems that OR was facing.

Setting clear objectives helped the team to focus their effort in the right direction, while using available resources to realistically address the issue. In a complex health care setting, naturally there are many root causes contributing to the issue of delay. By conducting the root-cause analysis, the team was able to identify one of the major root causes contributing to the delay in first surgery was due to the late arrival of OR staff. With this root cause identified, creation of appropriate intervention was possible. After analyzing and comparing various potential options, the team decided to implement an intervention that was feasible to execute and designed specifically to address the root cause -develop and enforce a policy to ensure OR staff arrive at work on time to prepare for the first surgeries in order to ensure first surgeries started on time. In public hospitals of Rwanda, morning shift starts at 7:00AM. While many staff arrived at the hospital at 7:00AM, they did not arrive at the work location and start working at the expected time. Without a written policy, there was no enforceable standard.

While the policy was specifically developed based on the root cause in this project, the intervention did not stop at just creating the policy, but included providing training sessions to the OR staff to ensure they understand the policy, and supportive supervision to ensure the policy was operationalized. After the policy was developed, it

was circulated in the OR for feedback and appropriate modifications were made. Support from the senior management team of the hospital was also essential. The project team and the OR department managers explained to the hospital management team about the nature and objective of the project and the hospital management team was supportive of the effort. By combining the bottom-up (buy-in from staff) and top-down approach (sign off by the management team), the implementation was met with a lot less resistance than anticipated. The intervention successfully increased the percentage of surgeries starting on time with the average duration in delay shortened. The percentages of staff arriving at work on time were also significantly improved across all three disciplines.

Although our study using SPS approach was found successfully in improving the percentage of surgery started on time, there are many other studies which successfully produced similar results using different approaches. For example, a study conducted in Harrisburg hospitals in USA successfully improved the starting time in OR from 13% to 80% in one hospital and from 7% to 83% in another hospital by applying the six sigma approach.[11] Although the approaches may be different, all these projects emphasized on using data as evidence to inform decision making, indicating the importance of accurate data in improving quality of services at hospitals.

This project addressed one root cause of the delay in surgery start time, however, we did not meet the hospital standard of 90%.[5] This project only addresses the issue about staff arrival time but there were other factors contributing to the delay in starting time of the OR that were found during the study, including breakdown of equipment, lack of communication between operating team members, and long set up time in preparing the operating room. We cannot definitively conclude the improvement was due to our quality improvement effort as we cannot control confounding factors. More quality improvement projects using SPS should be conducted to address the other root causes in order to further enhance the timeliness of starting first surgeries and thus improve the efficiency of the OR and quality of care. The study was only conducted in the OR department in one hospital, the results may not be generalizable to other settings.

Conclusion

Following the eight-step Strategic Problem Solving approach can help identify the factors influencing first case delays and thus create appropriate interventions to address the problem. More quality improvement projects should be conducted in health care settings using similar approach to address other root causes as well as other problems. Although the project showed positive results, long term sustainability was not assessed; longer term evaluation should be conducted to evaluate the sustainability.

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Conflicts of interest
No conflict of interest.

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Factors Contributing to Medication Administration Errors and Barriers to Self-Reporting among Nurses: A Review of Literature

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Abstract

Background

Medication Administration Errors (MAEs) are common among nurses and can threaten all patients' outcomes. Furthermore, MAEs are the leading cause of incidents in patient safety records worldwide.

Objective

To review the types of medication administration errors, factors contributing to MAEs and barriers to self-reporting among nurses.

Methods

A review of the literature was done and included original articles and grey literature from January 2011 until July 2017. An advanced search was done in Medline, HINARI, PubMed, CINAHL, Science direct, Google Scholar and gray literature using a Boolean combination of different keywords such as "medication administration error", "adverse drugs reactions", barriers and "self-reporting".

Results

257 articles were eligible for review but only27 articles met the inclusion criteria**.** Types of MAEs mainly focused on seven rights (right patient, right drug, right dose, right time, right route, right reason and right documentation). With regards to the types of MAEs, the wrong time was most prevalent in this study. Being overworked was the main factor contributing to medication administration errors. The barriers to self-reporting during MAEs were dominated by fear of disciplinary action. Nurses' characteristics such as age, experience, education, variations in how errors are defined and organizational factors such as power, distance and lack of reporting policies were found to be barriers to self-reporting. In addition to that, others were identified.

Conclusion

Globally, MAEs remain a pervasive problem among nurses. Contributing factors range from individual to organizational factors, and barriers to self-report are due to fear of legal action and punishment. There is a need to devise measures that will prevent these errors and to promote positive clinical outcomes of patients in healthcare settings.

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Keywords: contributing factors, medication administration errors, barriers, self-reporting, nurse.

Introduction

Medication administration error (MAE) is any preventable act that contributes to the failure of proper medication use or causes problems for the patient while in the care of a healthcare professional, clients, or consumer.[1] MAEs happen at different stages in the medication use process, including prescribing, provision and administration.[2,3] Such errors may be associated with healthcare professionals' practices or techniques, products or drugs and systems, including prescription, miscommunication, labeling, packaging and nomenclature, assembling, distributing and administration.[1]

MAE is a global challenge and 18.7%-56% of hospitalized patients face medication administration errors.[4]A study done in Australia found that 60% to 80% of patients faced MAEs and omission errors accounted for between 40% to 60%.[5] In Nigeria, the prevalence of MAEs among nurses was 64%, whilst 44% did not know of the existence of a reporting system, and a minority of 30% reported MAEs among pediatric nurses.[6]

MAEs impact negatively on patients in terms of morbidity, mortality, Adverse Drugs Reactions (ADRs), and increased the length of hospitalization. In the

report called "To Err is Human: Building a Safer Health System" published by the Institute of Medicine (IOM) located in the United States of America confirmed the fact that each year MAEs cause more than 7,000 deaths. [3] Additionally, the National Coordinating Council for Medication Error Reporting and Prevention of Medication Errors, USA, also revealed that medication errors cause injury to at least 1.5 million people, and to treat those injuries costs approximately 3.5 billion dollars per year.[7]

MAEs are common among nurses and can threaten all patients' outcomes, but mainly the pediatric population [8, 9], due to their physiological and developmental needs.[10] The available literature reported that nurses are reported to commit more MAEs as compared to other health care professionals like medicine and anesthesia.[11]

The first step to reduce MAEs among nurses is to identify the types of commonly occurring errors,[12, 13] assess the factors contributing to those errors, as well as barriers to self-reporting, and to set up appropriate preventive measures.[14, 15] However, there is no documented summative review of literature that identifies types of MAEs and factors contributing to medication administration errors, as well as barriers to self-reporting among nurses at the same time. Therefore, this current review aims to integrate studies that were done in relation to this topic and to identify the types of medication administration errors, factors contributing to MAEs and barriers to self-reporting. The identification of the aforementioned attributes will aid in implementing measures for the prevention of any MAEs and improving the management of patients in healthcare settings.

Methodology

A review of the literature was conducted and included original articles and grey literature from January 2011 until July 2017. An advanced search was done in Medline, HINARI, PubMed, CINAHL, Siencedirect, Google Scholar and gray literature using a Boolean combination of different keywords such as medication administration errors' AND 'factors' OR 'self-reporting' AND 'nurses' AND 'barriers'. For a comprehensive search, the following alternative words were used 'contributing factors to medication administration errors', 'medication errors', 'adverse drugs reactions' and 'barriers to self- reporting'. Both quantitative and qualitative studies written in English were included in this review to identify the factors contributing to MAEs and barriers to self-reporting among nurses. Comments, editorials, systematic reviews and studies with no outcome of interest were excluded from this review of the literature. Three authors did the first search and selection, and two other authors checked the articles and agreed on the included articles. All 27 articles were reported in the matrix which included authors, title and journal, study type, study design study population, and sample size (Table 1).

Data analysis

Descriptive analysis was used to identify the frequencies of MAEs, factors contributing to MAEs and barriers to self-reporting after committing an error. Tables were used.

Results

Studies included

Initially, 257 studies (Figure 1) were obtained from the research. Following inclusion and exclusion criteria, only 27 articles (Table 1) were considered including 26 quantitative studies and 1 qualitative study.

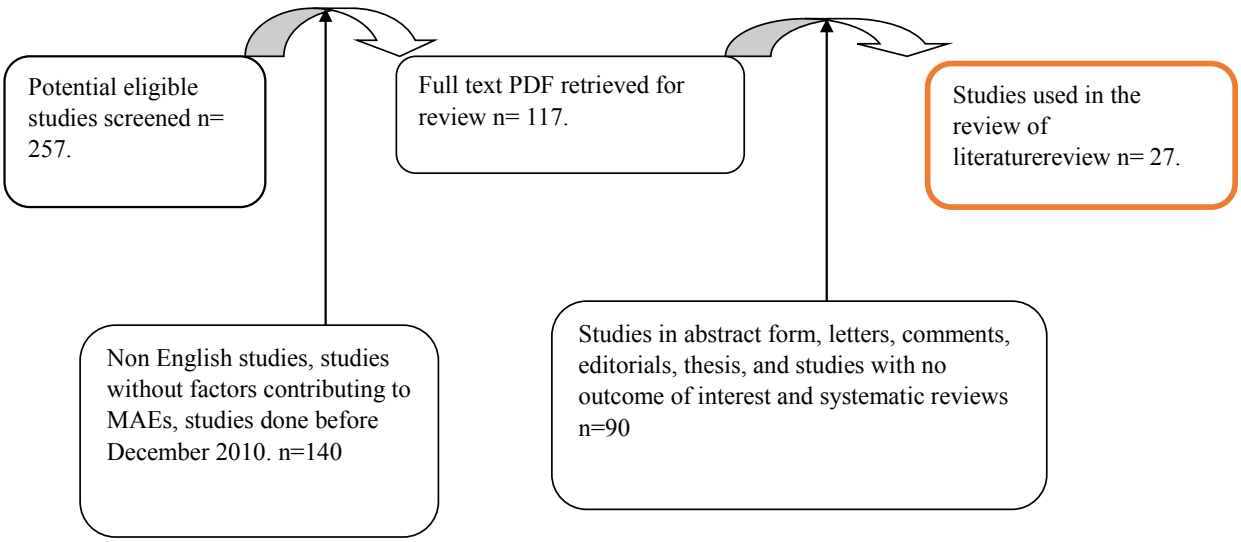

Figure 1. Diagram of studies selection flow

Table 1. Details of 27 articles reviewed

Author/Year/Title	Journal	Research approach and design	Country	Study population			Main results
					Types of MAEs	Factors contributing to MAEs	Barriers to self-reporting
Feleke, Mulatu and Yesmaw. 2015 Medication administration error: magnitude and associated factors among nurses	*BMC Nursing*	Quantitative Cross-sectional	Ethiopia	82	Documentation, technique and time	Age, experience, nurse to patient ratio, interruption, night shift and age of the patients	-
Aboshaiqah, 2014 Nurses' perception of medication administration errors	*American Journal of Nursing Research*	Quantitative Cross- sectional	Saudi Arabia	309	Time, technique, dose, medication without physician order and route	No knowledge on new medication, communication between nurses and physicians, change of orders frequently by physicians, some orders were not clear	-
Miladinia, Zarea, Baraz and Nouri, 2016. Pediatric nurses ' Medication Error : the Self-reporting of Frequency, Types and Causes	I*nternational Journal of Pediatric*	Quantitative Cross- sectional	Iran	53	Dose and drug	Poor medication knowledge and calculation skills.	-
Oshikoya et al., 2013 MAEs among pediatric nurses in Lagos public hospitals : An opinion survey	*International Journal of Risk & Safety in Medicine*	Quantitative Cross- sectional	Nigeria	75	Dose and time	Workload and no double checking	fear of intimidation, retribution or being punished and lack of policies in place to report errors.
Abdar, Tajaddini, Bazrafshan, Khoshab and Tavan, 2014 Registered nurses perception of medication errors: A cross-sectional study in Southeast of Iran.	*International Journal of Nursing Education*	Quantitative Cross- sectional	Iran	238	-	Workload, physician's and night shift	-
Bifftu et al., 2016 Medication administration error reporting and associated factors among nurses working at the University of Gondar referral hospital, Northwest Ethiopia	*BMC Nursing*	Quantitative Cross- sectional	Ethiopia	282	Route, time and patient	-	Level of education, disagreement over time - error definition, administrative reason and fear
Ebrahimipour et al., 2016 Evaluation of medication errors by nurses in hospitals affiliated with Mashhad University of Medical Sciences, Mashhad, Iran	*Patient Saf Qual Improv J.*	Quantitative Cross- sectional	Iran	530	Time, administration without physician order	-	Blame and fear of negative consequences

Rahimi et al., 205 Factors influencing medication errors according to nurses' decisions to do self-report	*Int J Basic Clin Pharmacol.*	Quantitative Analytical	Iran	100	Patient, dose, time, medication	Workload, unit and nurse-physician relationship	-
Zakharov, Tomas and Pelclova, 2012. Medication errors; an enduring problem for children and elderly patients	*Ups J Med Sci.*	Quantitative Retrospective	Czech Republic	215	Dose, drug and route	Sound-like drugs	-
Ojerinde and Adejumo, 2014. Factors associated with medication errors among health workers In University College Hospital, Nigeria	*Journal of Nursing and Health Science*	Quantitative Descriptive	Nigeria	333	Dose	Workload, interruptions, drug labeling and packaging	Fear of punishments
Khammamia and Rvangard, 2015. Medical errors and barriers to reporting in ten hospitals in Southern Iran.	*Malays J Med Sci*	Quantitative Cross-sectional	Iran	327	-	Largest hospital, internal wards, individual and organizational	Work experience
Vilela and Jerico, 2015 Medication errors : management of the medication error indicator toward a more safety nursing practice	*J Nurs UFPE line*	Quantitative Descriptive and Exploratory (Retrospective)	Brazil	90	Omission, patient and time	Lack of attention and workload	-
Johari et al., 2015 Medication errors among nurses in Government Hospital	*Journal of Nursing and Health Science*	Quantitative Cross- sectional	Malaysia	48	-	Personal neglect, heavy workload, new staff and complicated orders.	-
Tabatabaee et al., 2014 Barriers to medication error reporting from nurses' perspective: a private hospital survey.	*International Journal of Hospital Research*	Quantitative Cross-sectional	Iran	97	-	-	Fear of legal involvement, fear of losing a job, and fear of the consequences
Yung et al., 2016 Nurses' attitudes and perceived barriers to the reporting of medication administration errors.		Quantitative Cross-sectional	Taiwan	306	-	-	Fear of the negative consequences
Saleh Alduais et al., 2014 Barriers and strategies of reporting medical errors in public hospitals in Riyadh city: a survey-study.	*Journal of Nursing and Health Science*	Quantitative Survey approach	Saudi Arabia	467	-	-	Blame, punishment, filling in the form; poor knowledge
Bahadori et al., 2014 The factors affecting the refusal of reporting on medication errors from the nurses' viewpoints: a case study in a hospital in Iran.	*ISRN Nurs*	Quantitative Cross- sectional	Iran	100	-	-	Managerial factors, process of reporting and fear of the consequences of reporting.
Abou Hashish and El-Bialy, 2013. Nurses' perceptions of safety climate and barriers to report medication errors	*Life Science Journal*	Quantitative Correlational	Egypt	204	-	-	Disagreement over what a medication error is and its definition, and power distance.

Mohammad, Aljasser and Sasidhar, 2016. Barriers to Reporting Medication Administration Errors among Nurses in an Accredited Hospital in Saudi Arabia.	*British Journal of Economics, Management & Trade*	Quantitative Cross- sectional	Saudi Arabia	300			Administrative response and fear.
Hardmeier et al., 2014 Pediatric Administration Errors and Workflow Following Implementation of a Bar Code Medication Administration System.	*J Healthc Qual*	Quantitative Observational	California, USA	300	Route, technique, time and omission	-	-
Sears and Goodman, 2012. Risk Factors for Increased Severity of Paediatric Medication Administration Errors.	*Healthc Plicy*	Quantitative Observational	Canada	272	Time	Insufficient training, workload, teaching a student and off-service patient.	-
Abdel-Latif, 2016 Knowledge of healthcare professionals about medication errors in hospitals	*J Basic Clin Pharma*	Quantitative Cross- sectional	Saudi Arabia	151	Prescribing and administration errors	-	No clear mechanism available for reporting and poor knowledge about self-reporting.
Al-Youssif, Mohamed and Nabila, 2013 Nurses' experiences toward Perception of MAEs Reporting	*J Nurs Heal Sci*	Quantitative Cross- sectional	Saudi Arabia	253	-	Medication package, system, documentation-transcription, physician-nurse and pharmacy reasons.	Fear reasons, administrative reasons, disagreements over time - error definition reasons.
Zamanzadeh et al., 2012 Medication Error Reporting Rate and its Barriers and Facilitators among Nurses.	*J Caring Sci.*	Quantitative Descriptive		733	-	-	Blaming, negative consequences of reporting errors, and fear of reprimand and punishment.
You et al., 2015 Perceptions regarding MAEs among hospital staff nurses of South Korea.	*Int J Qual Heal Care.*	Quantitative Cross- sectional	South Korea	312	Patient, dose and drug	Workload and administering drugs with similar names or labels	Blaming and having too much emphasis on MAEs as a measure of nursing care quality.
Samsiah et al., 2015 Perceptions and Attitudes towards Medication Error Reporting in Primary Care Clinics : A Qualitative Study in Malaysia.	*PLoS One*	Qualitative Focus groups	Malaysia	31			The nature of the error, reporting system, organizational factors, provider factors, reporter's burden and benefit of reporting.
Abdullah and Sameen Barriers that Prevent the Nursing Staff from Reporting Medication Errors in Kirkuk City Hospitals.	*Kufa J Nurs Sci*	Quantitative Descriptive	Iraq	150	-	Physician orders are not clear, inadequate staff and absence of pharmacists	Fear, administrative process and lack of a clear definition of an error**.**

Types of medication administration errors

About 9 articles reported different types of medication administrations errors. The most reported medication administration error in this review was incorrect time.[5, 11–13, 15–19] The second error was the wrong dosage or wrong dosage calculation which was reported by 7 articles.[5, 9, 11, 15, 20–22] Other types of errors identified were incorrect medication,[9, 20–22]incorrect route,[12, 15, 18, 21]incorrect patient,[5, 12, 21, 22]error in technique,[16, 18, 23] omitting a drug due to drug availability[17, 18] and administration of a drug which is not prescribed.[13, 15]There was another type of error that was less apparent which is documentation.[16]

Table 2.Types of medication errors

Types of error	Number of articles
Incorrect time	9
Incorrect dosage	7
Incorrect technique	3
Incorrect medication	4
Incorrect route	4
Incorrect patient	4
Omission	2
Documentation	1
Administration of a drug which is not prescribed	2

Factors contributing to medication administration errors

Factors contributing to MAEs evident in this review can be categorized as follows; nurse-related factors, physician-related factors, nurse-physician related factors and organizational factors.

Table 3. Factors contributing to medication administration errors

Factors	Number of articles
Nurse factors	
Age	1
Work experience	1
Poor medication knowledge	2
Poor calculation skills	1
No double checking of drugs	1
Inattention, negligence	2
New staff	1
Medication package/similarity	4
Insufficient training	1
Teaching a student	1
Physician factors	
Physicians change orders	5
Nurse-physician factors	
Poor relationship between nurses and physicians	3
Organizational factors	
Nurse patients' ratio	1
Shift	2
Workload	8
Interruptions	2
Unit	1
Pharmacy reasons	1
Individual factors in the view point of manager	2
Patient factors	
Patient age	**1**
Off-service patient	1

Nurse-related factors

In this review, nurse related factors were factors such as demographic characteristics, including age,[16] work experience,[16] being new nurse,[24] individual knowledge and skills about a medication,[15, 20] and dosage calculation.[20] Other nurse related factors are linked to their daily work, such as lack of double checking of drugs, [11] inattention or negligence,[17, 24] how a medication is packaged/visible,[9, 21, 22, 25] insufficient training and teaching a student.[19]

Physician-related factors

Change of medication orders which sometimes are not clear were mentioned as factors related to MAEs in 5 articles.[11, 15, 24–26]

Nurse-physician related factors

Poor communication between nurses and physicians [5, 15, 25] is the only nurse-physician related factor contributing to medication administration error reported in this review.

Organizational factors

There were many errors related to organizations. Being overworked was most prominent.[5, 9, 11, 17, 19, 22, 24, 27] Nurse to patient ratio [16] was another factor where nurses claimed to care for more patients due to patient overcrowding. Nurses also reported that the night shift [16, 27] was contributing to medication administration errors. Medication errors also vary depending on the unit or the department.[14] They were also other organizational factors such as interruptions during medication administration,[9, 16] pharmacy procedures [25] and viewpoint of the manager regarding administration errors.[13, 14]

Patient-related factors

The factor reported here was age,[16] where errors in administration are commonly found in the pediatric department and off-service patient.[19]

Barriers to self-reporting

Regarding barriers to self-reporting evident in this review, they can be categorized as follows; reporting outcomes associated barriers, organizational barriers, nurse related factors and other various factors.

Table 4. Barriers to self-reporting

Self-reporting barriers	Number of articles
Self-reporting outcomes	
Fear of negative consequences	13
Blame	4
Organizational factors	
Lack of policies to report	1
Managerial/administrative factors	5
Process of reporting	4
having too much emphasis on MAEs as a measure of nursing care quality	1
Power distance	1
Nurse factors	
Level of education	1
Experience	1
Disagreement on what medication error is and its definition	4
Other	
Nature of the error	1

Self-reporting outcomes

In this review, fear of negative consequences such us punishment and losing a job after self-reporting [9,11, 32–34,12,13,25,26,28–31]and fear of blames [13,22,30, 33] were reported to be barriers to self-reporting.

Organizational factors

Lack of policies in different institutions,[11] managerial/ administrative factors,[12,25,26,31,32] unclear or long process to report,[23,30,31,34] such as having too much emphasis on MAEs as a measure of nursing care quality [22]were some of the factors that were reported in this review. Power distance,[35] the way nurses view and accept an unequal sharing of power from managers was another contributing factor.

Nurse-related factors

Disagreement of what medication error is and its definition[12,25,26,35]was reported as a barrier. Nurses who had less job experience were likely to report compared to those who have more experience.[14] It was also observed that nurses' level of education is a barrier to self-reporting,[12] with a bachelor's degree exhibiting higher perception levels of barriers in reporting MAEs .

The nature of the error

The nature of the error was found to be a barrier to self-reporting[34] among nurses. But in the end, nurses agreed that actual errors and near misses should be reported as this will portray a complete picture of all sources of risks and events that are harmful to patients.

Discussion

This literature review found 27 articles reporting the types of errors in the administration of medications, factors contributing to those errors and barriers to self-reporting when errors are committed. This review has an added value as it aids the reader in identifying the types of errors in the administration of medications, factors contributing to those errors and barriers to self-reporting at the same time. The previous reviews were only focusing on one aspect; either on errors in the administration of medication,[36] factors contributing to those errors,[37] or on self-reporting.[38]

Medication administration is the last and key step in the medication process, and if not done correctly, it can harm patients. Identifying administration errors is very important to determine early interventions. The literature showed that there are many types of administration errors.[39] The articles in this review identified various types of errors and are mainly focusing medication administration rights. The incorrect time was the most prevalent in this study. However, there is an inconsistency in previous reviews[36, 40] about the most commonly occurring administration errors probably due to different methods used in the different studies.

Factors of MAEs found in this review were wide-ranging. Being overworked was the most prevalent. The studies revealed that it is impossible to expect nurses to avoid MAEs when they themselves are stressed out and fatigued.[2,4,5,8,13,24] The issue of overworking among nurses was reported in other reviews[41]and revealed that overworked nurses almost seem to be the norm rather than the exception, but this negatively impacts patient safety. Nurses are human beings and have to get sufficient time to rest to ensure safe drug administration. The other commonly contributing factors were unclear orders from physicians and other organizational factors. The findings are reported in other previous reviews.[16,36,42]

Nurses have the professional, legal and ethical responsibility to recognize and report errors that occur during medication administration.[12] However, nurses may be reluctant to report for various reasons.The barriers to self-reporting during medication administration reported in this review were dominated by fear of disciplinary actions. Nurses' characteristics such as age, experience, education, variations in how errors are defined were found to be additional barriers. In addition to that, other organizational factors such as power distance and lack of reporting policies were identified. These findings are supported by other reviews and studies about barriers to self-reporting but with different ranking order.[12, 22, 43]

Limitations of the review

There was only one qualitative study identifying factors contributing to medication errors and barriers to self-reporting. The search was limited to studies from 2011 to 2017. More contributing factors to medication errors and barriers to self-reporting might have been missed from studies dated 2010 and earlier. Fewer studies were identified from African countries . Due to different geographical locations and working conditions among nurses, medication errors and barriers to self-reporting cannot be generalized to Africa.

Conclusion

In conclusion, incorrect time was commonly found in literature as a MAE. Workload was the common contributing factor to the MAEs and fear of negative consequences after self-reporting was the common barrier to self-report after committing an error. Most of the researches that have been conducted to rule out the factors contributing to MAEs and barriers to self-reporting have urged that the prevention be based first on the identification of those factors and on finding a way forward. They have also proposed some strategies that are not negative but encourage nurses to self-report, such as appreciation in the nurses meeting, providing some awards, etc. These measures also prevent the future occurrence of MAEs and increase the level of reporting.

Authors' contribution

The authors contributed in this manuscript as follows: AN, GC and MM developed the concept and study design. MC. U, ML. U and F N did the literature search and data analysis. All authors discussed the results and commented on the manuscript. All authors participated in responding to the reviewers' comments and approving the final version.

Conflict of interest

The authors declare that they have no conflict of interest.

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Impact of Remittances on Healthcare Utilisation and Expenditure in Developing Countries: A Systematic Review

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Abstract

Background
The poor and low-income earners used remittances to access healthcare services because most of them are not covered by private or government health insurance schemes.The money sent by migrant workers from abroad to their family members, relatives and friends serves as social protection, especially in developing countries where there are no standardised social protection programmes.
Objective
This review assesses the impact of remittances on healthcare utilisation and expenditure in developing countries.
Methods
A systematic search for relevant literature was conducted online for studies published between 2002 and 2018.
Results
The inclusion criteria of the study were met by 7 out of the 135 studies searched electronically. The studies conducted in Africa, Asia, Europe and Latin America, found that remittances contributed toincreased healthcare access, utilisation and expenditures. However, the degrees of these impacts were limited among the studies except in Armenia, where remittances significantly increased healthcare utilisation.
Conclusion
Although remittances can not serve as an alternative to formal healthcare insurance schemes, they can serve as a short-term measure in healthcare utilisation in developing countries. It is the responsibility of governments at all levels to formulate health policies that will embrace universal healthcare coverage for all citizens.
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Keywords: Expenditure, healthcare, remittances, utilisation

Introduction

Remittances, defined as financial inflow resulting from the cross-border migration of citizens of a country, are the transfer of money and goods sent by migrant workers to their country of birth.[1] The money sent by these migrant workers serves as social protection to their beneficiaries, especially in developing countries where there are no standardised social protection programmes. Policymakers, development experts, and academics have developed a vast interest in the huge amount of money flowing from migrants' host countries to their home countries.[2] Empirical evidence has shown that money sent by international migrants to their home enhances household consumption such as [3] clothing, energy, transport, food, spending on health and miscellaneous services.[4] The non-availability of comprehensive health insurance schemes in most developing countries and the high rate of poverty put people with low-income in vulnerable conditions when they are sick. This is because when they use their low-income for their health upkeep, they are pushed further below the poverty line.[5]
Consequently, one mechanism used by low-income earners or the poor to improve their health status is remittance from abroad. Studies have shown that remittances increase healthcare access to the poor and low-income earners in developing countries.[2,6] Other studies have proved that remittances can increase corruption and reduce political demand for change, resulting in a government reducing its social spending. [7–9] This review aims to evaluate the impact of remittances on healthcare utilisation and expenditure of recipients receiving remittances from abroad.

Methods

Search strategy

An online search was conducted for relevant literature with the aid of Google search engine, Google Scholar, PubMed and other websites relevant to the study areas.

Key search terms used include: "remittance," "health," "health utilisation,""healthcare expenditure"and "developing countries." The initial search for selected studies was focused on Asia and Latin America. This was because Asia had around 106 million international migrants, representing 41% of the global total in 2017.[10] While Latin America and the Caribbean had 38 million international migrants in different countries of the world as of 2017.[10] An additional search was conducted for studies in Africa because African international migrants were estimated to be 36 million in 2017.[10] The search was limited to English-language articles. Further search for important literature was done on reference lists of included studies. The selected studies were conducted between the period of 2002 to 2018 with most studies conducted in 2002 and 2009.

Study selection and eligible criteria

Titles and abstracts of all studies searched online were screened to determine their eligibility. Abstracts that reported the use of remittances on healthcare utilisation and expenditure along side other variables were included. In terms of geographical location, I included only studies on remittances and health in developing countries or emerging economies.

This review excluded studies that were written in other languages than the English language as well as studies that did not give in-depth details on remittances and health interface in their findings. Articles that were not research-oriented were excluded. Consequently, online web articles, newspaper reports and policy reports were not included in this review.

Data extraction

Data were extracted from the included studies of the review by the reviewer using a standardised data extraction tool from JBI SUMARI.[11] The data that were extracted include study citations (author names and date of publication), location, study methods, data collection sources, study population and main outcomes measured.

Data analysis and presentation

A standardised data collection form was used to extract relevant information from the included studies. Key data information such as citations, geographical setting, methods, data collection methods, year of publication and sample size were extracted and recorded.

Due to the heterogeneity of the included studies, no meta-analysis was included in the study; instead, a narrative synthesis was employed to analyse the data. This was after coding was used to identify salient information. The coding process of this review followed the breaking down of data to identify categories.[12] The initial coding (data reduction) was open coding. The following stage of coding involved linking categories of data identified from the initial coding. The last stage of coding drawed the conclusion and verification, and emerging themes were presented.[12]

Results

Study selection process

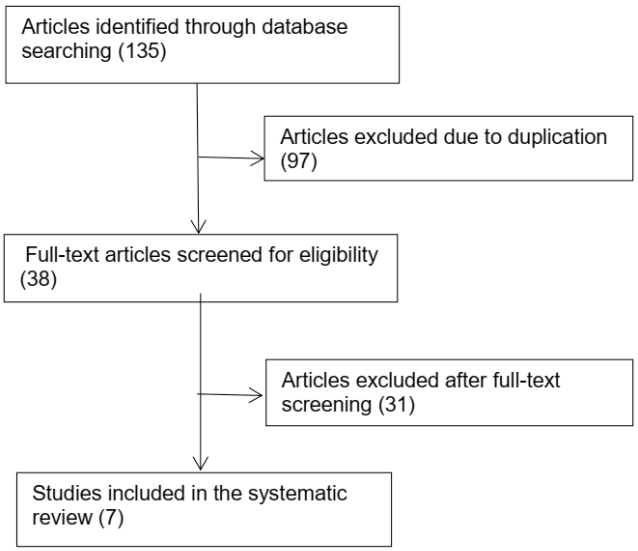

Figure 1: Flow diagram of study selection

Figure 1 presents a summary of the literature search and study selection process. The first search for selected literature produced 135 articles. I screened these articles screened for eligibility through titles and abstracts. The screening excluded 97 articles leaving 38 articles for additional screening. A full screening of abstract and text of the 38 articles that composed of peer-reviewed and grey literature left 31 articles being excluded because they did not meet the inclusion criteria of the systematic review. The remaining 7 articles were included in the final selection process.

Study characteristics

Table 1 displays the characteristics of the included studies. The included studies were conducted between 2002 and 2018. One of the studies was conducted in Africa (Rwanda), two in Asia (Armenia and Bangladesh), one in Europe (Albania) and three in Latin America (Ecuador and Mexico). In terms of methods, four studies used quantitative methods and the remaining three studies employed a mixed-methods approach. Most of the data of the included studies were sourced from government official documents and household surveys. Health variables measured by the studies include healthcare, health expenditure, healthcare utilisation and access to quality healthcare. As for article types, six were peer-reviewed articles while the remaining one is a discussion paper.

Table 1. Characteristics of included studies

Study	Year of publication	Country	Methods	Data collection source	Sample size	Outcome measured	Type of article
Al Kabir et al.[16]	2018	Bangladesh	Quantitative	Data on total remittance inflow ($US), and life expectancy at birth (as a proxy of health care)are taken from World Development Indicator (WDI)	N/A	Healthcare utilisation	Peer-reviewed
Amuedo-Dorantes and Pozo[18]	2009	Mexico	Quantitative	A nationally representative survey	N/A	Healthcare expenditure	Discussion paper
Frank et al.[15]	2009	Mexico	Mixed	Data were from a 2006 survey of 2 localities in the municipal city of Tepoztla´ n, Morelos	2,044 households	Healthcare utilisation, health expenditure	Peer-reviewed
Kalaj[6]	2015	Albania	Quantitative	Household survey data	N/A	Expenditure for medicines and other health services	Peer-reviewed
López-Cevallos and Chi[2]	2012	Ecuador	Mixed	Using data from the 2004 National Demographic and Maternal & Child Health Survey	(a) (b) 21,797 households	Healthcare utilisation, sexual and reproductive health	Peer reviewed
Murrugarra[17]	2002	Armenia	Quantitative	Integrated Living Standard Survey	3,600 households	Healthcare utilisation	Peer-reviewed
Rubyutsa[3]	2002	Rwanda	Mixed	Interview, data from the Department of Statistics at the National Bank of Rwanda	N/A	Healthcare accessibility	Peer-reviewed

Note: N/A means not available

Impact of remittances on healthcare utilisation and expenditure

For a proper understanding of this review, healthcare utilisation is defined as the "quantification or description of the use of services by persons for the purpose of preventing and curing health problems, promoting maintenance of health and well-being".[13] While healthcare expenditure is the "final consumption of health care goods and services (i.e. current health expenditure) including personal health care (curative care, rehabilitative care, long-term care, ancillary services and medical goods) and collective services (prevention and public health services as well as health administration)".[14]

Healthcare utilisation

Out of the 7 studies, five reported on the impact of remittances on healthcare accessibility/utilisation. [2,3,15–17] In Armenia, data from an Integrated Living Standard Survey showed that remittances responded to health needs.[17] However, remittances did not have a significant impact on healthcare utilisation because social assistance from the government significantly displaced remittances in healthcare utilisation.[17] In Bangladesh, remittance and health interface showed a bidirectional causality. In the long run, an increase in remittances allowed households to take quality healthcare if needed. [16] In contrast, in the short run, there was no relationship between remittances and healthcare utilisation.

In Ecuador, data from the 2004 National Demographic and Maternal & Child Health Survey and multilevel multivariate analysis of the relationship between remittances and healthcare utilisation showed that a household having a migrant abroad was positively associated with using an antiparasitic drug.[2] Aside from the use of the antiparasitic drug, household receiving remittances always visit medical centres for preventive cure. The study also found that low-income earners or the poor in Ecuador are the ones that predominantly use remittances for healthcare utilisation. However,

most low-income earners used remittances to offset their daily health needs and not on long-term healthcare. In Mexico, households that have migrants in the United States and receive remittances used them to gain access to healthcare services.[15] People covered by the government insurance programme with limited coverage used remittances to access services not provided by the Mexican government insurance programme.[15] In Rwanda, remittance data from the Department of Statistics at the National Bank of Rwanda revealed that people used remittances for the improvement of family lives and healthcare accessibility and utilisation.[3] Table 2 reviews the impact of remittances on healthcare utilisation.

Table 2. Review of effects of remittances on healthcare utilisation

Country	study	Study design	Population	Main outcomes	Results	Impact
Armenia	Murrugarra, [17]	Censored model	3,600 households receiving remittances	Healthcare demand	1,000 Armenia Drams (ADM) in remittances (approximately US$2) enhanced healthcare utilisation rates in a very small, but significant increase.	Positive
Bangladesh	Al Kabir et al.[16]	Time series	Individuals that have received remittances	Healthcare utilisation	In the long run there was positive relationship between remittance and health improvement. While in the short run there was no positive relationship between remittances and health improvement.	Mixed
Ecuador	López-Cevallos and Chi[2]	Cross-sectional	10,813 households that have received remittances	Healthcare utilization	Remittances improved the use of antiparasitic drug (odds tatio)(OR = 1.46, 95% CI = 1.23 – 1.73; OR = 1.34, 95% CI = 1.16 – 1.55) "after adjusting for predisposing, enabling, and need factors"	Positive
Mexico	Frank et al.[15]	Multinomial logistic regression	Remittance recipients	Healthcare utilisation	Of those households that had received remittances, over twice as many had spent remittances on health than had not (7% versus 3%).	Positive
Rwanda	Rubyutsa[3]	N/A	Members of Diaspora community	Healthcare accessibility	Reason for remittance include healthcare issues	Not clear

Health expenditure

Three studies have reported the impact of remittances on health expenditure.[6,15,18] Table 3 shows the review of the effects of remittances on health expenditure in Albania, an analysis of the impact of remittances on health expenditures showed that households receiving remittances increased their health expenditures on drugs and other health-related services such as medical visits and laboratory services.[6] The impact was significant for households in rural areas because the total expenditures on drugs increased by approximately $86.27. The findings of the study reveal that remittances have a positive impact on the expenditure for medical visits and laboratory services.[6]

In Mexico, data from a nationally representative survey carried out by the Mexican statistical institute showed that remittances increased health expenditures for both low-income households and rich households.[18] High-income households receiving $5.25 increment in remittance increased expenditures on health by $0.37. [18] A similar increment in low-income households showed that spending on health rose by $0.21.[18] In Mexico, the health status of remittance beneficiaries was not significantly related to remittances and expenditure on healthcare.[15]

Table 3. Review of effects of Remittances on health care expenditures

Country	Study	Study design	Population	Main outcomes	Results	Impact
Albania	Kalaj[6]	Propensity score matching	Households with migrants abroad	Healthcare expenditure	Remittances have a positive and statistically significant impact on health expenditures	Positive
Mexico	Amuedo-Dorantes and Pozo[18]	N/A	Remittance recipients	Healthcare expenditure	$86.27 rise in remittance from abroad increases healthcare expenditures between $0.26 and $0,32	Positive
Mexico	Frank et al.[15]	Multinomial logistic regression	Remittance recipients	Healthcare expenditure	Amount of remittances was not significantly correlated with expenditure on healthcare	Negative

Discussion

A systematic review methodology was used to assess the impact of international remittances on healthcare utilisation and expenditure in developing countries. Remittance has come a long way in assisting low-income earners in increasing access to healthcare services. Findings from this review have shown that remittance plays a vital role in healthcare utilisation and expenditure to recipients of remittances from abroad.

In most developing countries where there are no universal health insurance schemes, the poor have difficulty accessing healthcare services because of their socioeconomic status. For instance, in Kenya, poverty reduced the probability of infants and children aged 1-14 from visiting modern healthcare facilities.[19] Poverty is a barrier to the poor in accessing healthcare services in developing countries.[20] Where there are no social health insurance schemes for low-income earners, remittances serve as a substitute for those that have international migrants that are sending money to them. [2,17]

Findings from this review showed that remittances led to healthcare access and utilisation among remittance households. In Armenia, Bangladesh, Ecuador, Mexico and Rwanda, households receiving remittances could utilise healthcare services. However, most of the studies did not show the level of healthcare utilisation and accessibility among the recipients. These findings aligned with the findings of Amakom and Iheoma.[21] In their study, an increase in remittance was responsible for the increase in healthcare utilisation.

In the case of health expenditure, an increase in remittances corresponded with an increase in healthcare expenditures among recipient households. The findings from this review showed that remittance increased household expenditure in Albania and Mexico. While in Albania there was a significant impact between remittances and health expenditures; in Mexico, the studies assessed did not show the level of impact. These findings are aligned with the findings of Amuedo-Dorantes and Pozo)[22] in Mexico. The review revealed that healthcare expenditures increased in response to an increase in remittances. In addition, primary healthcare expenditures were higher in households with high remittance inflow. Such households spent between 5% and 9% remittance receipts on primary healthcare services.[22]

From the findings of this review, it has been established that the poor are the ones that predominantly use remittances for healthcare services. This is because of the lack of formal insurance coverage to protect them against health shocks. Remittance serves as social protection to the poor and from the evidence presented in this review , remittance is a social safety net in the absence of a formal social insurance programme.

Those that have families in developed countries and are receiving remittances from abroad feel protected against health shocks. In the contrary, those who do not have families abroad and are not receiving remittances or social assistance, find themselves in precarious conditions when they fall sick. Therefore, governments in developing countries should establish universal healthcare coverage that will protect both the poor and rich against health shocks, help to reduce health inequality among the population and boost the economy.

This review has some limitations: it only analysed studies that were published in English Language, whereas, there are quality studies in other languages that assessed the impact of remittances on healthcare utilisation and expenditure. In addition, some included studies lacked adequate data and some of their findings are too clumsy to understand for analysis. Most of the studies did not expatiate on the the degree of the impact of remittances on health outcomes.

Conclusion

This review assesses the impact of remittances on healthcare utilisation and expenditure in developing countries. The studies included in the review have established that remittances play a vital role in allowing the poor and low-income earners to access healthcare services as well as increasing expenditure on healthcare goods and services. Those in rural areas used remittances for healthcare services to a larger extent than those living in urban areas.

Remittances cannot serve as a substitute or alternative to formal healthcare insurance schemes, but they complement private or government own insurance programmes. While remittances serve only a few households in accessing healthcare services, it is the responsibility of the governments to design and implement universal healthcare coverage that will serve all individuals.

Authors' contribution

ONA designed the study, performed the selection of the included studies, conducted data analysis and approved the final manuscript.

Conflict of interest

The author of this study declared no conflict of interest.

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RWANDA JOURNAL OF MEDICINE AND HEALTH SCIENCES INSTRUCTIONS TO AUTHORS

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a) Journal article:

Smith JJ. The world of science. Am J Sci. 1999;36:234–5.

O'Mahony S, Rose SL, Chilvers AJ, Ballinger JR, Solanki CK, Barber RW, et al. Finding an optimal method for imaging lymphatic vessels of the upper limb. Eur J Nucl Med Mol Imaging. 2004;31:555–63. doi:10.1007/s00259-003-1399-3.

Slifka MK, Whitton JL. Clinical implications of dysregulated cytokine production. Dig J Mol Med. 2000. doi:10.1007/s801090000086.

b) Books and chapters:

Wyllie AH, Kerr JFR, Currie AR. Cell death: the significance of apoptosis. In: Bourne GH, Danielli JF, Jeon KW, editors. International review of cytology. London: Academic; 1980. p. 251– 306.

c) Organization site

ISSN International Centre: The ISSN register. http://www.issn.org (2006). Accessed 20 Feb 2007.

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Original research articles include but are not limited to biomedical, clinical, behavioral research, health management research, and educational research in medicine and health sciences. These full-length articles should describe new and carefully confirmed findings, and experimental procedures should be given in sufficient detail for others to verify the work. They should be double spaced, between 3,000 and 6,000 words, excluding tables, figures and references. The articles should have the following main sections: Introduction,

Methods, Results, and Discussion.

Title (maximum 150 characters)

It should be in title case format in which all words except prepositions and conjunctions start with capital letter. Title should be short describing the contents of the article for comprehension and easy electronic retrieval. There should be no abbreviations in the title unless they are units of measurements. The title page should include the authors' full names. The authors'affiliation addresses should be listed below the names. A superscript number just after the author's name and in front of the appropriate address should indicate the affiliation. Provide the full postal address of each affiliation, including the country name. Indicate the Corresponding author with asterisk after the author's name and before 'Corresponding author' in the footnote along with e-mail address and phone number.

Abstract

The abstract should be between 150-200 words and must include the following subtitles: Background, Objectives, Methods, Results, and Conclusions. No references should be cited and abbreviations must be avoided. Following the abstract, about 3 to 10 key words that will provide indexing references should be listed. It is recommended, to use keywords from the National Library of Medicine's (NLM) Medical Subject List, whenever possible. The suitability of keywords can be checked on the NLM MeSH Browser at

http://www.nlm.nih.gov/mesh/ (e.g. MeSH on Demand: http://www.nlm.nih.gov/mesh/MeSHonDemand.html).

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Methods

Detailed description of the investigation process and statistical methods should be provided such that verification by other researchers can be feasible. However, only truly new procedures should be described in detail, previously published procedures should be cited, and important modifications of published procedures should be mentioned accordingly. Research instruments such as questionnaires should be described adequately. A statement of the ethical issues including protection of human subjects and informed consent should be included (please see: http://www.wma.net/en/30publications/10policies/b3/index.html).

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It should emphasize new and important aspects of the study in relation to available standards and published evidence without repeating the results in detail. Explanation of the findings and their implications for future research and policy should be provided. Limitations of the study should be highlighted. Conclusions and recommendations should be related to the objectives and results of the study.

2. Review Articles

Review articles should include critical assessment of the works cited, explanations of conflicts in the literature, and analysis of highly significant topics in health sciences illustrating trends and discoveries, significant gaps in the research, current debates and ideas of where research might go next. The review can contain up to 6,000 words, six (6) figures, and three (3) tables, and it should be arranged in four sections: Abstract, Introduction, Topics (with headings and subheadings), Conclusions and Outlook. Systematic reviews shall be prepared in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and can be up to 6,000 words. Systematic reviews highly pertinent to public health policy and practice will be given priority. Examples of narrative review articles, and systematic review articles with and without meta-analysis:

•Church JA, Fitzgerald F, Walker AS, Gibb DM, Prendergast AJ. The expanding role of co-trimoxazole in developing countries. Lancet Infect Diseases. 2015; 15:327-39.

•Khan KS, Wojdyla D, Say L, Gülmezoglu M, Van Look PF. WHO analysis of causes of maternal death: a systematic review. Lancet. 2006; 367:1066-74.

•Sonuga-Barke EJS, Brandeis D, Cortese S, Daley D, Ferrin M, Holtmann M, et al. Nonpharmacological interventions for ADHD: systematic review and meta-analyses of randomized controlled trials of dietary and psychological treatments. Am J Psychiatry. 2013; 170:275-89.

•Taggart J, Williams A, Dennis S, Newall A, Shortus

T, Zwar N, et al. A systematic review of interventions in primary care to improve health literacy for chronic disease behavioral risk factors. BMC Fam Pract. 2012; 13:49.

3. Short Communications

A Short Communication of 1,000-1,500 words presents a completed study that is limited in scope about novel techniques, or special cases. It should contain an abstract (up to 150 words) and one other section combining introduction, methods, results, discussion and conclusion. It should contain a maximum of two figures and one table, and not more than 10 references. Example of short communication:

•Sereekhajornjaru N, Somboon C, Rattanajak R, Denny WA, Wilairat P, Auparakkitanon S. Comparison of hematin-targeting properties of pynacrine, an acridine analog of the benzonaphthyridine antimalarial pyronaridine. Acta Trop. 2014; 140:181-3.

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Letters, usually from authorities in the subject, should have a concise title, be short (up to 200 words, about a Journal article; and up to 400 words not about a Journal article), may have a single table or image, and up to 4 references . It should not include unpublished data or material published elsewhere. The submission of the letter to the journal gives the Editor authority for its publication and it is subject to editing. Example of letter to the Editor:

•Fox MP, Rosen SB. Response to defaulting from antiretroviral treatment programmes in sub-Saharan Africa: a problem of definition. Trop Med Int Health. 2011;16:392.

5. Perspective articles

A perspective article is a thought stimulating opinion essay on a health related topic and must be prepared in a similar way to a Review article. It should contain about 1,500-3,000 words, and a maximum of 30 references. Example of personal view paper:

•Tully CM, Lambe T, Gilbert SC, Hill AVS. Emergency Ebola response: a new approach to the rapid design and development of vaccines against emerging diseases. Lancet Infect Dis. 2015; 15:356-9.

6. Lessons from the field

These are papers that capture experiences and practice gained in solving specific public health problems in the settings in which the practice takes place (e.g. leadership and management, cultural organization, and resources) in order to put the lessons gained in the right context. These papers present the process by including the following information: Background or motivation describing how the problem was perceived, context or settings, evidence and action, identification of solutions, how partners were engaged and lessons learned. The papers have an abstract of up to 250 words, and a total of up to 1,500 words, with two figures and two tables. Example of Lessons from the Field article:

•Khan MI, Sahito SM, Khan MJ, Wassan SM, Shaikh AW, Maheshwari AK, et al. Enhanced disease surveillance through private health care sector cooperation in Karachi, Pakistan: Experience from a vaccine trial. Bull World Health Organ. 2006; 84:72-7.

7. Editorials

Editorials usually provide commentary and analysis concerning an article in the issue of the Journal in which they appear or to a theme. They have no abstract, may contain subheadings to guide the readers, and are limited to 1,000-1,500 words, excluding title and references, one figure or table and a maximum of 10 references. Examples of Editorial papers:

•Stein JH. Cardiovascular risks of antiretroviral therapy. New Engl J Med. 2007; 356:1773-5.

•Schünemann HJ, Moja L. Reviews : Rapid ! Rapid ! Rapid ! … and systematic. Syst Reviews. 2015: 4:46.

•Cram P, Rush RP. Length of hospital stay after hip fracture. BMJ. 2015; 350:h823.

8. Case reports

Case reports describe an unusual disease presentation, a new treatment, an unexpected drug interaction, a new diagnostic method, or a difficult diagnosis. Case reports should include relevant positive and negative findings from history, examination, and investigation and can include clinical photographs. Additionally, the author should make it clear what the case adds to the field of health care. It should include an up-to-date review of all previous cases in the field. These articles should be no more than 2,500 words with up to 3 figures and 2 tables and a maximum of 15 references. Case Reports contain five sections: Abstract (100 words), Introduction, Case Presentation (clinical presentation, observations, test results, and accompanying figures), Discussion, and Conclusions. Examples of case report:

•Mitchell HK, Thomas R, Hogan M, Bresges C. Miracle baby: managing extremely preterm birth in rural Uganda. BMJ Case Rep. Published online 4 June 2014. doi: 10.1136/bcr-2013-200949.

•Shahani L, McKenna M. Primary pulmonary lymphoma in a patient with advanced AIDS. BMJ Case Rep. Published online 19 December 2014. doi:10.1136/bcr-2013-203265.

•Henneman D, Bosman WM, Ritchie ED, van den Bremer J. Gastric perforation due to foreign body ingestion mimicking acute cholecystitis. BMJ Case Rep. Published online 4 March 2015. doi:10.1136/bcr-2014-207806.

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