Assessment of the Application of m-Learning Technology by Nurses, Midwives and Students in Tanzania

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Research Article

ABSTRACT

The use of mobile phones to access health learning materials (m-Learning platform) was implemented in Tanzania to provide nurses and midwives with current information on sexual and reproductive health and legal health rights of youth aged 15-24 years. We evaluated the use of the "Jibu" m-Learning platform after one year of implementation. the objective of the research were i) To assess the proportion of nurses, midwives and students who were not or were no longer currently using the ""Jibu"" m-Learning platform (dormant users) at the time of the assessment. ii) To explored the reasons that led to dormant use of the m-Learning platform. In 2015, we conducted a mixed methods evaluation study including 428 randomly selected participants (comprising nurses, midwives and students) from 1468 people trained on the use of the "Jibu" m-Learning platform to assess the use of the platform a year after training. We used questionnaires and semi-structured interview guides to measure the number of people who had not used or had stopped using "Jibu" m-Learning since training (dormant users) and those who were using the platform for accessing health materials (active users). We also explored reasons for not using the platform. Out of 428 participants, 320 (74.8%) were dormant users and 108 (25.2%) were active users. Participants came from 16 health facilities and 9 nursing schools. Following their initial training, 91% of dormant users had not used and 9% had stopped using the "Jibu" m-Learning platform. The reasons given for dormant use included lack of mobile phones, inability to pay for internet bandwidth and inadequate technical support. The uptake of m-learning technology by nurses and midwives in Tanzania is low because of inadequate technical support and not owning mobile phones that support the technology. There are design and implementation challenges that need to be considered when introducing new technology like m-Learning.

INTRODUCTION

In Tanzania, nurses and midwives are the frontline health workers and constitute more than 60% of the health workforce [1]. The health workforce is overwhelmed in terms of scope of professional practice and in spending more time with patients in a country where shortage of human resources for health is a crisis [2]. Because of the crisis, nurses and midwives are sometimes required to perform duties and responsibilities for which they have few or no competencies.

Mobile Learning (m-learning) in the health system includes the use of mobile devices to disseminate learning materials to health workers for purposes of updating knowledge and improving their skills. The m-Learning can be used as a quick and easy way to provide health care workers with on-the-job information [3]. The m-Learning has been shown to be effective in the health care setting, in different countries and settings [4]. In Chandran [5], m-Learning led to self-motivation and provided a sustainable and cost-effective means of educating health workers on-site. There is already robust evidence from systematic reviews that m-Learning technology (also known as m-health) can improve the quality and safety of health care while reducing its cost [6,7]. Evidence from implementation of m-learning for nurses and midwives in Kenya has shown positive outcomes for addressing the shortage of nurses as well as improving health outcomes, health services efficiency, competencies and positive response to training.

The adoption of m-Learning in less developed countries like Tanzania requires a careful design to fit into the contexts and facilitate the implementation process. In Tanzania, the m-Learning platform called ""Jibu"" was adopted in the health sector by AMREF Tanzania in 2014 to provide nurses and midwives access to health materials to enrich them with correct and up-to-date information on sexual and reproductive health as well as legal health rights of youth aged 15-24 years. One year after the initial training and enrollment into the m-Learning platform, we assessed the proportion of nurses, midwives and students who were not or were no longer currently using the ""Jibu"" m-Learning platform (dormant users) at the time of the assessment. We also explored the reasons that led to dormant use of the m-Learning platform.

METHODS

The ""Jibu"" m-Learning project

The ""Jibu"" (which means "Answer" in Swahili) m-Learning project was implemented from May 2014 to April 2015 in Tanzania. The one-year project was implemented by AMREF Health Africa in collaboration with AMREF Flying Doctors in the Netherlands and Rutgers World Population Foundation Centre for the Study of Adolescence. ""Jibu"" focused on improving the quality of care by nurses and midwives by providing them access to training, reference materials and peer-learning opportunities. Specifically, the project provided nurses and midwives with access to information on sexual and reproductive health and rights through their mobile phones so they could provide quality services to adults and young people. The project was implemented in nine regions of Tanzania (Dodoma, Kilimanjaro, Mbeya, Mtwara, Dar es Salaam, Tanga, Mara, Mwanza and Zanzibar), targeting nurses and midwives in 12 nursing schools and 22 health facilities (hospitals, health centres and dispensaries) where AMREF Tanzania had already created m-Learning awareness for m-Learning. Nursing schools were included to facilitate support and supervision of nursing students during their internships.

The ""Jibu"" m-Learning platform is an application comprised of six online learning modules in the areas of health services management, pharmacology, nursing process, research, sexual and reproductive health rights, and peer learning. These modules are updated regularly. A total of 1468 nurses, midwives and nursing and midwife students, of whom 994 were women and 474 were men, were trained to join and use the platform. Participants were selected based on their willingness and readiness. Nine trainings were conducted between February and March 2014 in each of the nine regions where the program was implemented.

The trainers for the m-Learning technology were technicians on information technology, tutors and the district nursing officer from the selected nursing schools and districts. The two project officers from AMREF Tanzania who were involved in the design of the m-Learning platform also participated in the training and were responsible for providing technical support such as ensuring the user names and passwords worked and that all materials were accessible. The ongoing technical and administrative support on ""Jibu"" was provided by the district nursing officers, coordinators, technicians on information technology, mentors, trainers of trainees and school administrators. All project locations had access to the internet. The ""Jibu"" m-Learning project did not provide participants with mobile phones or help them with internet bandwidth.

Study Design

We conducted a cross-sectional mixed methods evaluation study between May and July 2015. Quantitative methods were used to determine the proportion of m-Learning platform users who were dormant a year after the training. We also measured the length of time from the training to stopping use among dormant users, as well as associated factors

including age, sex, years in service, professional status and monthly income. Qualitative methods were used to explore reasons for stopping or not using the m-Learning platform.

Subjects and Sampling

The study included 428 trained nurses, midwives and nursing and midwifery students trained on the m-Learning platform. A multilevel sampling technique was used to enroll study participants. Six of the nine project regions were purposively selected based on the following criteria: geographical disparities, infrastructure (including coverage by mobile networks), level of urbanization (city vs. municipality) and socio-economic development characteristics. Nine districts within the six regions were then selected based on the same criteria to obtain equal representation from rural and urban districts. Simple random sampling was used to obtain approximately 30% of all trained nurses, midwives and students from each of the study districts (Figure 1).
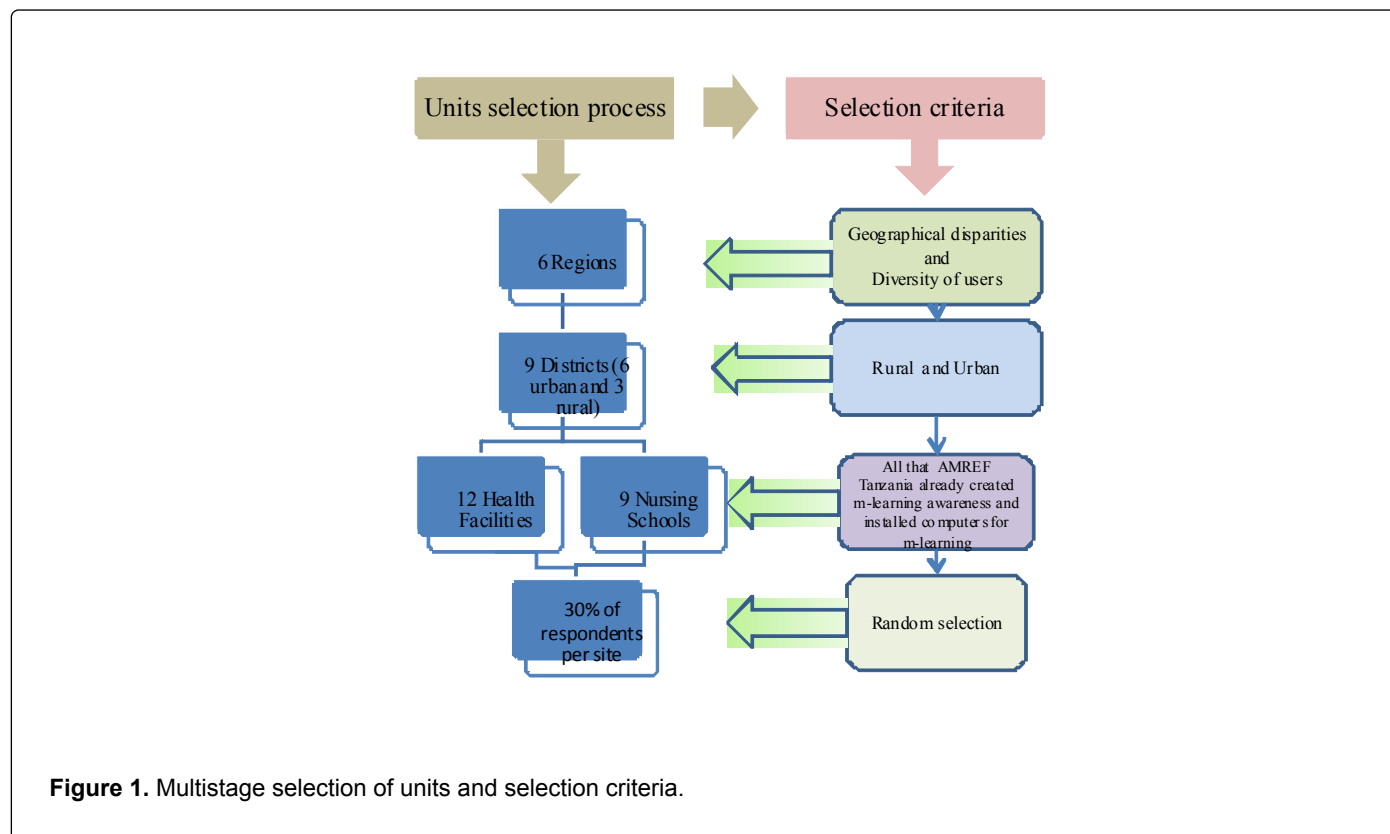

Figure 1. Multistage selection of units and selection criteria.

The study also included 21 supporting team members from the six selected regions who were engaged in the implementation of the program. The 21 participants comprised of the district nursing officers, coordinators of the m-Learning program in the health facilities and nursing schools, information technology officers, mentors, trainers of trainees, tutors and schools' administrators. The participants were purposively and conveniently selected from a total of 53 m-Learning supporting team members recruited from the six regions. The criteria for selection were involvement in the implementation of m-Learning in the selected health facilities and nursing schools from the selected regions.

Data Collection

Quantitative data

Questionnaires were used to collect quantitative data from users. The data collected included basic demographic and professional information, whether or not the respondent was a dormant user defined as never used the m-Learning technology or had used the m-Learning technology for any period of time since its introduction by the ""Jibu"" m-Learnig technology but stopped before this study. For respondents who had used the m-Learning technology but then stopped, a question was asked about the time from training completion to stopping using the platform. Data was collected over a period of 14 days by six research assistants from AMREF Tanzania who were trained on data collection.

Qualitative data

All study participants who said they were dormant users were asked open-ended questions about the reasons for being dormant. These questions were the last section of the questionnaire and were administered immediately following

the quantitative section. Specifically, participants were asked why they didn't use or why they had stopped using the m-Learning platform.

To enrich the understanding of reasons for not using the platform, qualitative interviews were also conducted with the m-Learning supporting team members. The interview guide for the support team was developed based on the roles each category of respondents played in the implementation of the m-Learning project. The respondents were asked about their experience in supporting the m-Learning implementation process and the challenges observed or encountered. Qualitative data were collected in the form of in-depth note-taking.

Data Analysis

Quantitative data were first analysed to determine the proportion of participants currently using the m-learning platform to access the modules (active users) and the proportion of participants who had not used or stopped accessing the m-Learning platform (dormant users). Quantitative analysis was done using SPSS (version 19). We tabulated key participant characteristics by their dormancy status, including age, sex, years in service, professional status and monthly income.

Qualitative data were transcribed and thematically analysed based on emerging themes on reasons for dormant use of the m-Learning platform. Data from study participants (nurses, midwives and nursing and midwifery students) were analysed separately from data from the supporting team members. Related themes from the two categories of participants were compared, merged and summarised into broad themes.

Ethical Issues

Ethical clearance was granted by AMREF Tanzania and the Tanzanian National Institute for Medical Research (NIMR). Participants gave written consent to participate in the study. Responses were reported anonymously.

RESULTS

Study Population and Dormant Users

The "Jibu" m-Learning project trained 1468 nurses, midwives and nursing and midwifery students in the "Jibu" m-Learning platform, out of which 428 constituted the study population. Of the study population 108 (25.2%) were active users and 320 (74.8%) were dormant users (**Table 1**). Of the dormant users, 91.0% had never used the "Jibu" m-Learning platform, 2% had used it between three and four months, 5% had used it for a period of less than three months, and 2% did not remember. This implies that majority of the sampled population have never used "Jibu' m-Learning platform. The age categories of dormant users were 16.6% for 15-20 years, 40.9% for 21-25 years, 20.3% for 26-30 years, and 22.2% for above 31 years. Dormant users were 39.8% male and 60.2% female.

Table 1. Characteristics of Active and Dormant Users of Mobile Technology in an Evaluation of "Jibu" m-Learning Project in Tanzania, 2015.

Variables	Total Pop.		Active		Dormant		Chi^2	P-value
	N	%	N	%	N	%		
Total	428	100	108	100	320	100		
Age (years)								
15-20	68	15.9	15	13.9	53	16.6	3.054	0.383
21-25	182	42.5	51	47.2	131	40.9		
26-30	90	21.0	25	23.1	65	20.3		
31+	88	20.6	17	15.7	71	22.2		
Sex								
Male	172	40.2	45	41.7	127	39.8	0.115	0.409
Female	255	59.6	63	58.3	192	60.2		

Years in Service								
Not in service	138	32.2	0	0	138	43.1	139.2	0.000
1-2 years	148	34.6	86	79.6	62	19.4		
3-4 years	51	11.9	10	9.3	41	12.8		
Above 4 years	91	21.3	12	11.1	79	24.7		
Professional status								
Nursing student	308	72.0	105	97.2	203	64.2	45.7	0.00
Midwifery student	23	5.4	3	2.8	20	6.3		
Nurses	53	12.4	0	0	53	16.8		
Midwives	40	9.3	0	0	40	12.7		
Monthly Income *								
No monthly income	184	43	0	0	184	57.5	197.89	0.00
Below 450,000/-	65	15.2	11	10.2	54	16.9		
450,000 – 900,000/-	150	35.0	97	89.8	53	16.6		
900,000 – 1,350,000/-	25	5.8	0	0	25	7.8		
Above 1,350,000/-	4	0.9	0	0	4	1.2		

With regard to years in service; **Table 1** shows that 43.1% of dormant users were not in service, and this constituted the largest proportion. By contrast, 19.4% of dormant users had been in service for 1-2 years, 12.8% had been in service for 3-4 years, and 24.7% had been in service for more than four years. Those who had been in service for 1-2 years had the lowest proportion of dormant users.

The only active users of the "Jibu" m-Learning platform were nursing and midwifery students; no nurses and midwives who were not students were active users. A proportion of each income earning group were active and dormant users; whereas the proportion of dormant users with income below Tanzania Shillings (Tshs.) 450,000/= were 16.9% and between Tshs. 450,000/= and 900,000/= were 16.6% (**Table 1**). The lowest proportion of dormant users were those with income between Tshs. 900,000/= and 1,350,000/= (7.8%) and those with income above Tshs. 1,350,000/= (1.2%). Only those who earned a monthly income were active users; all those without a monthly income were dormant users (57.56%).

The percentage of dormant users varied across regions (**Table 2**). Of the 6 regions included in the study, the lowest proportion of dormant users was reported in Dar es Salaam (45.8%) and Mtwara (46.9%), compared to the regions with the highest proportion of dormant users, Kilimanjaro (84.9%) and Dodoma (84.2%).

Table 2. Proportion of the study population trained on m-Learning Platform who were active and dormant users after one year, by region of Tanzania, 2015.

Region	Trained (N)	Active Users		Dormant Users		Chi2	P-value
		(N)	(%)	(N)	(%)		
Dar es Salaam	48	26	(54.2)	22	(45.8)	46.616	1< 0.001
Mtwara	32	17	(53.1)	15	(46.9)		
Tanga	26	10	(38.5)	16	(61.5)		
Mbeya	93	20	(21.5)	73	(78.5)		
Dodoma	57	9	(15.8)	48	(84.2)		

Kilimanjaro	172	26	(15.1)	146	(84.9)		
Total	**428**	**108**	**(25.2)**	**320**	**(74.8)**		

Nurses, midwives and nursing and midwifery students reported reasons that influenced dormant use of m-Learning platform. **Table 2** shows that out of 320 respondents, 44% said their phones had no ability to support m-Learning technology, 35% said the given password could not log in, 15% said they did not receive a password, 4% said they didn't have mobile phones, and 2% said they lacked technical support (data not shown).

Reasons for Dormant use of m-Learning Platform: Qualitative Perspectives

The results from qualitative data showed that dormant users had a variety of experiences with the m-Learning technology. Some of the dormant users used the "Jibu" m-Learning platform for a short time and others did not use it at all. Those who had used the m-Learning technology had used it for varying timeframes; most had used it for a period of less than three months, and others between three and four months. Some could not remember when they stopped using the platform.

Dormant users of m-Learning technology gave different reasons for not using the "Jibu" m-Learning platform. The findings from support team members were consistent with reasons given by nurses, midwives and nursing and midwifery students. These reasons were: lack of prompt responses from AMREF project team to faciliate coordinators in nursing schools and districts to address password problems; lack of mobile phones by the majority of nursing and midwifery students; unrealiable technical support at the schools and health facilities; and losing their phones.

There was also concern from the support team about the workload to provide support. For instance, one of the respondents said that:

"The workload is big; you find you need to serve students and a lot of other things crop up."

This view was supported by another respondent who said that:

"You can set an appointment with interested people to train them during working hours, but it is difficult to meet on the same shift because you are sometimes so engaged."

Another respondent agreed, saying that:

"Coordination of m-Learning is an extra role to us, it has been a challenge to get time to allocate for m-Learning that matches availability of targeted users."

Other responses pointed out that still of nurses, midwives and nursing and midwifery students prefer to use classrooms learning and thus less motivated to use mobile phone for learning. One of the respondents has also said that:

"The contents are not detailed, so it is not satisfactory to us until you read other materials. It is also not updated regularly, so we kept on asking why things are always the same"

Other reasons pointed out by the support team for dormant use of the m-Learning platform included: inability of users to buy internet bandwith to access m-Learning platform; delays in the supply of usernames and passwords by AMREF project team; and students were not allowed to use mobile phones during classes.

DISCUSSION

This study was designed to assess the proportion of nurses, midwives and nursing and midwifery students who did not use the m-Learning platform (dormant users) within one year of receiving training, and to assess the reasons for not using or no longer using the platform. We observed that a very high percentage (75%) of trained users reported being dormant users. The main reasons were lack of mobile phones, inadequate technical support and inability to pay for internet bandwidth. Thus, 75% of the target population are likely to have missed the intended benefits of the "Jibu" m-Learning project of having access to health materials and enrichment with correct and up-to-date information on sexual and reproductive health and legal health rights of youth aged 15-24 years.

Most of the dormant users were not students and had no income. Those newly employed in their job were more likely to use the m-Learning technology than those who had been in service for a long time. Those who had been in-service for 1-2 years were the majority of m-Learning users. All of the participants who were not employed were dormant users. Interestingly, those with low income were the majority f dormant users when compared to those with higher income. Overall, those not in service, purely students (not employed at all) and with no income were all dormant users. In contrarst, the majority of active users were those in service, nurses and midwives and earning more income. The analysis

across regions showed that Mtwara region and Dar es Salaam had the lowest proportion of dormant users, even though Mtwara is more remote and less developed in terms of mobile infrastructural development than the industrial and business city of Dar es Salaam. Although it is beyond the scope of this study to provide regional contextual information that may influence the dormant use of m-Learning technology, the proportion of dormant use was likely to have been influenced by the available proportion of nurses and midwives willing and ready to develop their careers.

The major reasons for not using or stopping using the m-Learning platform were: inability of password to log in, inability of the mobile phone to support the m-Learning technology, not receiving a password, lack of mobile phone and lack of technical support. Most of these reasons link to the design and implementation of the project. It was clear that delays in receiving usernames and passwords to use m-Learning and lack of reliable technical support contributed greatly to increasing the proportion of dormant users, especially to those who were willing and ready to use the m-Learning platform. Since provision of a mobile phone was not one of the project components, it appears that this was an important omission in the design of the program. The design that ensures ownership of appropriate working tools and reliable technical support [8] is likely to reduce the proportion of dormant users. Incentives for using or changing to a new learning approach is associated with how people accepted it as an approach they can easily adapt to Marshal [9].

It's important to consider the technical support team when planning implementation of a m-Learning technology, as it plays a key role in influencing the use of the m-Learning technology. The perception from the support team that support of m-Learning technology is extra work was critical. Tutors and coordinators represent the technical and administrative support for the uptake of the m-Learning technology. Low or high engagement in providing the required support is likely to have influenced the level of dormant users. There should be incentives to the support team to support and facilitate the uptake of the technology; otherwise there will be low support and therefore high proportion of dormant users.

The study had limitations. It is possible that some users stopped using the m-Learning technology for reasons that were not captured in this study. This was a cross-sectional study conducted to evaluate a project implemented for one year to see the proportion of dormant users and reasons. The study could not also involve reasons for active users. The comparisons of reasons from dormant users and active users are likely to provide more robust reasons on the use and non-use of m-Learning technology.

In this study of implementation of a m-Learning technology, the proportion of dormant users was high and was influenced by lack of mobile phones, perceived relevance and incentives of the m-Learning technology as compared to the traditional way of learning, ureliable technical support and delays in responding to the expressed needs by the support team. The study showed that uptake of m-Learning technology requires comprehensive assessment of the context and proper design as well as adequate implementation of the project aspects. Further assessement is needed on specific contextual issues and comparing the reasons from both active and dormant users to get more in-depth information for designing and implementing projects with similar nature. As indicated in the literature, dormant use of m-Learning technology can be influenced by perceived relevance and usefulness, supporting environment including availability of internet connectivity, and ownership of mobile phones that support the relevant technology [10,11].

CONCLUSION

Nurses and midwifery constitute more than 60% of the health workforce in Tanzania, where shortage of human resources for health is a crisis. Their capacity and continuous updates of knowledge is significant to the performance of the health systems. m-Learning provide a relevant and useful platform for nurses and midwifery in accessing learning materials for capacity building and continuous updates of knowledge without leaving their working or studying environment at limited cost. However, the uptake of m-learning technology by nurses and midwives in Tanzania is low because of inadequate technical support and not owning mobile phones that support the technology. There are design and implementation challenges that need to be considered when introducing new technology like m-Learning. Consideration of contextual issues including supporting environment such as availability of internet connectivity, and ownership of mobile phones that support the relevant technology are critical component in influencing the effective utilization of m-learning technology by nurses and midwifery.

POLICY IMPLICATIONS

m-learning contribute to the implementation of digital health which is one of the main emphasis of the Tanzanian national health policy and Health Sector Strategic Plans that focus on use of ICT for improving capacity of nurses and midwifery in health facilities and health training institutions for better performance and quality delivery of health services.

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CONFLICT OF INTEREST

The authors declare that they have no competing interests.

AUTHOR CONTRIBUTIONS

HAM conceived and designed the study and carried out the data collection and analysis. JP carried out the data collection, F-table and cleaning. HAM and JP drafted the manuscript. All authors read, revised and approved the final manuscript.

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