Field report

Rural community health workers' readiness for mobile-phone based telemedicine uptake in India

Aravind Gandhi P[1a], Soundappan Kathirvel[1a], and Shyam Chakraborty[2]

[1]Department of Community Medicine, School of Public Health, Postgraduate Institute of Medical Education and Research, India
[2]Oy Trinnect Ltd, Finland

Abstract

Objective: Healthcare services using mobile-phone based telemedicine provide simple technology that does not require sophisticated equipment. This study assessed community health workers' knowledge, attitude, and practice (i.e., their readiness) at the village level for uptake of mobile-phone based telemedicine.

Materials and Methods: This cross-sectional study was conducted among 80 community health workers, including Auxiliary Nurse Midwives, Multipurpose Health Workers and Accredited Social Health Activists working in a rural health block of India. A pre-tested, semi-structured, interviewer-assisted, self-administered questionnaire was used to assess their mobile-phone based telemedicine readiness.

Results: Sixty (75.0%) health workers owned mobile phones. The median readiness score for mobile-phone based telemedicine was 109.0. The Accredited Social Health Activists showed a better attitude toward mobile-phone based telemedicine than others. There was a significant moderate positive correlation (r=0.67) between knowledge and practice domains. Community health workers who had smartphones showed a significantly better attitude than those who did not.

Conclusion: Training programs on telemedicine service delivery, focused on Auxiliary Nurse Midwives/ Multipurpose Health Workers, can improve their attitudes towards telemedicine. A better attitude of the Accredited Social Health Activists must be leveraged to initiate mobile-phone based telemedicine services on a pilot basis initially and later scaled up in other settings.

Key words: telemedicine, mobile-phone based healthcare services (mHealth), attitude, health worker, India

Introduction

In India, a low-middle income country and the second-most populous in the world, it is reported that there are a staggering 478 million mobile Internet users[1]. Healthcare services using mobile-phone based telemedicine (MBT) provides a simple and easy-to-operate technology that does not require sophisticated equipment. The penetration of mobile phones and the Internet into rural areas makes mobile-phone based healthcare services (mHealth) a feasible solution for delivering health services in India. Healthcare services at the village level in India are provided by community health workers (CHWs), namely, Accredited Social Health Activists (ASHAs), Multi-purpose Health Workers (MPHWs), and Auxiliary Nurse Midwives (ANMs) of India's public health system. The government of India's flagship eSanjeevani project on telemedicine services also depends on these CHWs to enable the connection between the rural and hard-to-access populations in availing healthcare services[2]. Healthcare worker-assisted consultation services are an important method in telemedicine services. The benefits of using mHealth by CHWs range widely from workload reduction to improvement in health outcomes[3, 4]. To enable this, it is imperative that CHWs are comfortable with and have a comprehensive understanding of information and communication technology (ICT).

Studies from India and other countries have explored the

perception and acceptability of CHWs and the effectiveness of mHealth application in delivering services in various vertical health programs[3, 5–9]. Thomas *et al.* reported that health workers had a high acceptance of mHealth solutions; however, they CHWs were not included in the study. Shah *et al.* studied the delivery of maternal and newborn care services by ASHAs, and found a high degree of acceptability of mobile applications among them[8]. However, the majority of studies were focussed on use of health-related mobile applications to improve the knowledge and healthcare practices of CHWs. The assessment of training needs and readiness of CHWs is important to conduct before initiating telemedicine services so that the program is sustained at the grassroot level[10]. Therefore, we conducted the current study to assess the knowledge, attitude, and practice(s) of CHWs, that is, their readiness, for the uptake of MBT at the village/rural level.

Materials and Methods

Study design

This was a cross-sectional study conducted in 2019.

Study settings

The study health block was a rural community health block in a district in northern India, with a total population of 273,101, distributed across 214 villages.

Study population

This study was conducted among ANMs, MPHWs, and ASHAs working in the study health block. The Auxiliary Nurse Midwives were in charge of the health sub-center, which is the first point of contact between the rural population and the public healthcare system. The ANMs deliver preventive, promotive, and curative healthcare services related to reproductive, maternal, communicable/non-communicable diseases, as well as immunization. The MPHWs are appointed per sub-center, and share the work of ANMs in delivering healthcare services and disease control activities. The ASHAs are volunteers identified from the local community and are trained in delivering home and community-based healthcare services. They cover a population of approximately 1,000 in rural areas. Approximately 70 ANMs/MPHWs and 230 ASHAs were expected to be in the study area delivering healthcare services at the community level.

Sample size and technique

Using convenience sampling, we included 80 CHWs as participants. A complete enumeration of all consenting CHWs in the study area was performed. They were contacted at sub-centers, blocks, and district-level meetings to participate in this study.

Study procedure

A pre-tested, semi-structured, interviewer-assisted, self-administered questionnaire was used to elicit socio-demographic characteristics and gauge the readiness of CHWs (Supplementary material 1). The tool assessed readiness through three domains: knowledge, attitude, and practices regarding mobile-phone, Internet, mobile application, and telemedicine use. The knowledge domain comprised of 14 questions (scores 14–60), the attitude domain consisted of 20 questions (scores 20–100), and the practice domain consisted of five questions (scores 5–15). Responses to the questionnaire were scored based on correct responses (yes/no/do not know) using a Likert scale of 1 to 5. The combined score of the three domains was considered the MBT readiness score.

Statistical analysis

Statistical analysis was performed using SPSS v26.0. Correlation within the readiness domains and between readiness and continuous variables was assessed using the Pearson correlation coefficient. The normality of the readiness scores was tested using the Shapiro–Wilk test. The Kruskal–Wallis test was used to assess the significance of the association between readiness domains and the designation of CHWs. A *P*-value of <0.05 was considered statistically significant.

Ethical clearance

Ethical clearance was obtained from the Institutional Ethics Committee of Postgraduate Institute of Medical Education and Research, Chandigarh, India. Written informed consent was obtained from all study participants.

Results

Of the 80 CHW participants, 45 (56.3%) were ASHAs and 35 (43.7%) were MPHWs/ANMs. The median (IQR) age of MPHW, ANM and ASHA participants were 41.0 (35.0, 47.8), 48.0 (38.0, 52.0), and 39.0 (30.0, 42.0) years, respectively. With the exception of one MPHW, all participants (79) were female (98.8%) and 75 (93.7%) were educated up to senior secondary school level. The median (IQR) work experience of the participants was 8.0 (1.3–11.0) years in total in their designation and 7.0 (1.0–10.0) years in their current place of post, respectively (Table 1). A total of 60 (75.0%) health workers owned mobile phones; among these, 37 (61.7%) owned a smartphone and 23 (62.2%) had the Internet access on their smartphones. Furthermore, 35 (43.8%) community health workers reported that they had experience using the Internet before, and 27 (33.8%) had used the Internet on their smartphones. Telemedicine services had been used, either as providers or beneficiaries, by 33 (41.3%) of the participants in our study.

Table 1 Demographic and mobile-phone usage characteristics of community health workers in northern India

Characteristics	n	(%)
Total	n = 80	
Median (IQR) age in years	41	(35.0, 47.8)
Sex		
Female	79	(98.8)
Male	1	(1.2)
Education		
Till middle school	15	(18.8)
Secondary school	31	(38.8)
Senior secondary	29	(36.3)
Graduate and above	5	(6.3)
Designation		
ASHA	45	(56.3)
MPHW	25	(31.3)
ANM	10	(12.4)
Median (IQR) total experience (in years)	8	(1.3–11.0)
Median (IQR) experience (in years) at current post	7	(1.0–10.0)
Mobile & Internet usage characteristics		
Owns a mobile phone	60	(75.0)
Owns a smart phone	37	(46.3)
Ever used Internet	35	(43.8)
Used internet in the phones	27	(33.8)
Has internet in their phones	23	(28.8)
Ever used telemedicine	33	(41.3)

IQR: Interquartile range; ASHA: Accredited Social Health Activist; MPHW: Multi-purpose health workers; ANM: Auxiliary Nurse Midwife.

The median (IQR) readiness score for MBT was 109.0 (95.5, 123.0) in our study (Table 2), which was just above 50% of the maximum total score (maximum 175). Among the domains, a significant difference was found between the attitude towards MBT and the designation of CHWs, with ASHAs showing better attitude than others. However, the overall readiness did not show any differential presentation between the designations. The CHWs who availed or provided telemedicine services had a significantly better attitude ($P<0.001$) and higher overall readiness ($P<0.05$) regarding mobile-phone based telemedicine services than their counterparts who did not (Table 3). Similarly, CHWs who had a smartphone showed a significantly better attitude than those who did not ($P<0.05$).

There was a significant moderate positive correlation ($r=0.67$) between knowledge and practice domains among the study participants ($P<0.05$). A weak yet significant negative correlation was found between overall readiness, attitude, and total years of experience and years in the current post ($P<0.05$).

Table 2 Knowledge, attitude, practices and overall readiness among community health workers towards mobile-phone based telemedicine

Domain (Minimum–Maximum)	Median	Q1, Q3
Knowledge (14–60)	20	15.0, 33.0
Attitude (20–100)	75	68.0, 80.0
Practices (5–15)	10	9.0, 12.8
Overall Readiness (39–175)	109	95.5, 123.0

Q1: First Quartile; Q3: Third Quartile.

Discussion

The CHWs will play a major role in delivering telemedicine to the underserved population and at the sub-center level in India. Vedanthan *et al.* reported that the use of mHealth applications by CHWs improved the linking of patients with health centers[5]. The ANMs in India are provided with an android-based application called ANMOL (ANM Online), which enables the paperless collection and transmission of data regarding the healthcare services provided by the

Table 3 Association between domains of readiness towards mobile-phone based telemedicine and designation of HCWs

Variable	Mean rank	Kruskal–Wallis H	*P* value
Knowledge			
ASHA (45)	39.8	0.543	0.762
MPHW (25)	39.6		
ANM (10)	45.6		
Attitude			
ASHA (45)	51.3	23.4	<0.001
MPHW (25)	23.8		
ANM (10)	33.7		
Practices			
ASHA (45)	38.8	2.2	0.339
MPHW (25)	39.7		
ANM (10)	50.3		
Overall Readiness			
ASHA (45)	45.0	5.4	0.066
MPHW (25)	31.6		
ANM (10)	42.3		

HCWs: Health Care Workers; ASHA: Accredited Social Health Activist; MPHW: Multi-purpose health workers; ANM: Auxiliary Nurse Midwife.

ANMs at the community level[11]. However, the ANMOL application does not have a facility for telemedicine services.

Overall readiness for MBT uptake was 'moderate' among the CHWs. This may be due to the non-availability of mobile phones, particularly smartphones. Although 60% of CHWs had a mobile phone, only 46.3% owned a smartphone. The overall knowledge level of the CHWs was found to be low. The CHWs with higher knowledge scores had better telemedicine practices. The ASHAs' better attitude compared to other CHWs and the service delivery to a limited population (≤1,000) has important implications such as training and rolling out of MBT effectively at the village level. The ownership of smartphones has gained prominence in light of our finding that CHWs who own smartphones had a significantly better attitude towards providing MBT. This suggests that building better capacity by providing the necessary training and smartphones to CHWs will improve their readiness levels, which is consistent with findings in the existing literature[12]. Internet connectivity and speed issues in field areas are challenges that must be addressed[13]. The previous experience of CHWs with telemedicine may also ensure a better attitude.

The negative correlation between readiness and years of experience of CHWs raises concern, similar to the findings of a previous report[3]. This might be due to low education level and low technology-related proficiency among experienced CHWs, as well as the reluctance in accepting the technology by CHWs who have been working with conventional systems for a longer time. It might also be due to the fact that so far, knowledge of MBT has not been made mandatory for these CHWs by the local health authorities. Future studies assessing the technological skills of CHWs and exploring the potential reasons for the negative correlation with years of experience are needed. In contrast, Sukum *et al.*, in their study among healthcare workers in Ghana, reported that there was no association between years of experience and attitude towards computer applications[14]. It has been reported that older workers are pessimistic regarding their ability to learn the technology[14].

This study is the first to assess the readiness of CHWs for MBT services in rural India, and includes all three cadres of CHWs on the frontline. However, our findings must be interpreted with caution owing to the restricted study area and the non-random sampling technique.

Conclusion

Further qualitative studies must be conducted among the study participants to identify potential barriers and facilitators in implementing MBT services. Training programs on telemedicine service delivery must be provided to CHWs, with a special focus on MPWs/ANMs to improve their attitude toward this. The relatively better attitude of the ASHAs must be leveraged to initiate MBT services on a pilot basis initially and later scaled up to include all villages. The surge in COVID-19 cases in India indicates the importance of contactless modalities of healthcare service delivery for non-emergency services and stable COVID-19 patients undergoing home isolation. Therefore, the involvement of CHWs in MBT may be pilot tested after ensuring the necessary training and infrastructure at the CHW level is provided. The ANMOL may also be upgraded to include the telemedicine facility, along with uninterrupted Internet and tested for the telemedicine services.

Conflict of interest: None.

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