SHORT ARTICLE

Factors influencing Community Healthcare Worker's adoption of mobile health technology (mhealth): A case of sangini supportive supervision (sangini) app, Uttar Pradesh, India

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Abstract

Background: Community Health Workers (CHWs) are agents in delivering primary healthcare. mhealth is being used to improve their performance. However, there are little evidences on factors influencing adoption of technology. Henceforth, sangini app was undertaken for analysis. **Objective**: To investigate factors of adoption of sangini app among users and non-users. **Methods & statistical analysis**: Constructs from Technology Acceptance Model (TAM) and Theory of Self-Efficacy (SE) were used as tools for study. The study used an experimental study design Kaushambi and Pratapgarh districts of Uttar Pradesh (U.P.), India was selected as intervention and control groups respectively. The study sample consisted of CHWs i.e. 90 Sangini and 270 ASHAs. Two sample t test with equal variances and univariate regression analysis was applied. **Results**: TA and SE were predicators however; individual characters didn't impact adoption of mhealth. **Conclusion**: There is need to comprehend factors influencing adoption of mhealth to improve performance of CHWs.

Keywords

CHWs; TAM; Self-efficacy; mhealth; Sangini; ASHAs; Humans; Telemedicine

Introduction

Community Health Workers (CHWs) are key agents to achieve sustainable development goals (SDGs) by promoting and delivering healthcare services (1). In order to provide quality services, it is essential to maximize their productivity (2). Mobile health (mhealth) offers promising results to improve healthcare system in low- and middle-income countries (3). Despite of numerous initiatives there are little evidences on factors stimulating decision of CHWs to adopt mobile technology. Technology acceptance model (TAM) is the most promising model to explain user acceptability (4). The elementary model outlines a facilitating role of Perceived Usefulness (PU), Perceived ease of use (PEOU), Attitude (AT) and behaviour (BI) between external variables and system usage (5). Evidences also demonstrate use of new technology depends on individual's perceived self-efficacy (SE) (6) as individuals who feel efficacious chooses more challenging tasks and adopts technology faster (7).

Aims & Objectives

To investigate factors of adoption of sangini app between users and non-users

Material & Methods

Project context: The sangini app is an android and web based, multi-media healthcare application for sangini (appointed under NRHM, at block level at a ratio of 1:20 ASHAs) (8) who acts as supervisor of ASHA and are the crucial link between the community and the health system. Catholic Relief Services (CRS) piloted and supported mobile health application in Kaushambi district of Uttar Pradesh which is now run by NRHM, U.P. The sangini app aims to improve performance of sangini

through improved knowledge and skills on supportive supervision (9).

Study Population, Area and Sampling Procedure: An experimental study design was used. The study was based in Uttar Pradesh, U.P. and was conducted from February to December 2019. For the study, intervention group was purposely selected where the sangini app intervention was implemented to its fullest and earliest since 2014 in the Kaushambi district of U.P. Furthermore, the control group was selected by matching for IMR and MMR ±3 statistics of Kaushambi henceforth Pratapgarh district was selected. Multi-stage random sampling technique was used.

The sample included key CHWs i.e. Sanginis (Primary users of the app) and ASHAs. All sangini working in intervention group i.e. 67 sangini were selected for the study. For selection of ASHAs for the intervention group sample size was computed on 0.4/SD with 95% confidence level and 90% power, with 201 ASHAs per group considering non-response rate. From the list of 20 ASHAs under each sangini hence 3 ASHAs were randomly selected. Due to time constraints only 50% of sample was taken from control group. Out of the total sample incomplete and missing data was excluded thus a total of 90 sangini and 270 ASHAs formed the sample for the study. Consent was taken from all respondents before interview.

Tools and techniques: In order to analyze factors of adoption TAM was used as a framework which includes PU, PEOU, AT, BI. We also included statements of perceived Self-efficacy (SE) and collected information on Individual Characteristics (IC) (age, education level and work experience) as additional constructs. For this study a composite score was formed for TAM variables (PU, PEOU, AT, BI) and is titled as technology acceptance (TA). The study included five-points Likert scale from "strongly disagree" to "strongly agree".

The statements were translated to their local language i.e., Hindi Language. After completing pilot study, irrelevant questions were removed, validity and reliability assessment was completed. The Cronbach's alpha was tested it was found that all values were within acceptable range. The data was collected by visiting site and by meeting respondents in their familiar setting i.e., at the health center. The questionnaire was orally narrated and filled by the researcher. Respondent's confidentiality was maintained by not collecting any personal identifiable information.

Ethical Approval: Ethical approval was obtained from Institutional Ethics Committee, Lady Irwin College, University of Delhi.

The following hypothesis were formulated on the basis of literature review:

- **HI:** There is no significant difference between perceived self-efficacy level of CHWs where sangini app is implemented and where it is not implemented
- **HII:** There is no significant difference between technology acceptance level of CHWs where sangini app is implemented and where it is not implemented
- **HIII**: Perceived self-efficacy level of CHWs would have no effect on technology acceptance level
- **HIV**: Individual characteristics of CHWs will have no effect on technology acceptance level

Data analysis: The difference between mean of two groups were analyzed using two sample t test with equal variances. The relationship and association between dependent and independent variables were tested using regression with the statistical software Stata 14, the statistical analysis was performed and results were calculated. To consider the effect of clustering (ASHA under Sangini) generalized estimating equation was used to see the difference in two group.

Results

HI & HII were tested with CHWs in both groups. Hypothesis were tested using two sample t test with equal variances using STATA.

Sangini

As given in (Table 1) we found average of SE of Sangini in intervention group is significantly higher than in control group [p value - 0.000]. It was also found average level of TA in intervention group is significantly higher than in control group [p-value = 0.0000].

ASHA

As given in (Table 1) we found average of SE of ASHA in intervention group is significantly higher than in control group [p value - 0.000]. It was also found average level of TA in intervention group is significantly higher than in control group [p-value = 0.0000].

HIII & HIV were tested with CHWs in both groups. The relationship and association of technology acceptance with individual characteristics and SE were tested using regression with the statistical software Stata, the statistical analysis was performed and results were calculated.

Sangini

As given in (Table 1) in univariate regression analysis we found SE was positively associated with TA [β(95% CI):1.10 (.83, 1.38)]. After adjusting age and using multivariable regression analysis we found SE was a significant independent predictor of TA. [β (95% CI): 1.16, (.83, 1.48)].

ASHA

As given in (Table 1) in univariate regression analysis we found SE was positively corelated with TA [β (95% CI): 1.49 (1.41, 1.57)]. After adjusting age and using multivariable regression analysis we found SE was a significant independent predictor of TA. [β(95% CI): 1.49 (1.41 ,1.58)]

Discussion

M-Health interventions have the potential to streamline CHWs functioning, enhance their abilities and performance and improve community health outcomes.

Our research tries to close the gap of insufficient evidences required to deliver an effective mhealth strategy by examining factors influencing adoption of technology by CHWs. Our study included 90 sangini and 270 ASHAs from intervention and control group. Of these most of the women are middle aged married women who are intermediate pass (Table 2) and have received training. There were only few variations in their years of work experience. In addition, 100% sangini had received additional training for operating sangini app in intervention group.

The study provided empirical evidences for the hypothesis tested. The results indicated significant positive difference between SE and TA amongst sangini in intervention and control groups. This may imply usage of mobile technology by sangini might increase their SE and TA. Correspondingly use of mobile technology by sangini who are the prime users of technology has also positively impacted the SE and TA of ASHAs under her supervision. Thus, this may imply usage of mobile technology can strengthen healthcare systems at all levels of CHWs.

The regression analysis aids in concluding SE as the most important factor in acceptance towards technology thus confirming similar results of previous studies (6, 10). In contrast, IC such as age, education level and work experience does not impact the decision to adopt technology among CHWs. This may imply use mobile technology by CHWs might increase their perceived self-efficacy which might result in increased technology acceptance.

Conclusion

CHW's technology acceptance (PU, PEOU, AT, BI) and self-efficacy are the factors influencing adoption of mobile technology based sangini app. However, individual characters such as age, education level and work experience did not impact their adoption of mobile technology. There was no disparity between factors of adoption between users and non-users of sangini app. Despite variations in infrastructure and internet connectivity mobile technology is emerging as a solution in healthcare our study provides evidences to improve effectiveness of such initiatives. Thus, future mhealth app developers and program implementors can target specific needs of CHWs and its impact on overall healthcare system which will strengthen healthcare delivery and improve health outcomes.

Recommendation

There is a need to understand factors of adoption of mhealth by CHWs which would aid in maximising their productivity and thus strengthening healthcare delivery and improve health outcomes

Limitation of the study

Sample size was reduced to 50% in control group due to time constraints

Relevance of the study

The study provides evidences of focusing on factors such as technology acceptance and self-efficacy of CHW's which would lead to adoption of technology.

Authors Contribution

SJ: literature search, data acquisition, guarantor. SJ & AK: conceptualization, design, definition of intellectual content, data analysis, statistical analysis, manuscript preparation, editing and review.

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Tables

TABLE 1 TWO SAMPLE T TEST WITH EQUAL VARIANCES OF TA AND SE OF CHWS & UNIVARIATE REGRESSION ANALYSIS OF SE AND IC WITH TA

Two sample t test with equal variances of TA and SE of CHWs				
SANGINI	**Group (a) mean±SD n=60**	**Group (b) mean±SD n=30**	**Unadjusted Difference (95%CI) [p-value]**	**Adjusted Difference (95%CI) [p-value]**
Self-efficacy (SE)	44 ±2.7	34.6 ±3.3	-9.32 (-10.57 -8.07) [0.000]	-9.13 (-10.70, -7.57) [0.000]
Technology Acceptance (TA)	91.21 ±5.08	80.69 ±11.60	-10.51 (-13.84 -7.18) [0.000]	-11.13 (-15.33, -6.93) [0.000]
ASHA	**Group (a) mean±SD n=180**	**Group (b) mean±SD n=90**	**Unadjusted Diffrence(95%CI) [p-value]**	**Adjusted Diffrence(95%CI) [p-value]**
Self-efficacy (SE)	43.78±2.34	17.77 ±6.29	-26.09 (-27.52 -24.67) [0.000]	-26.04 (-27.49, -24.59) [0.000]
Technology Acceptance (TA)	93.5±2.26	50.91 ± 11.65	-43.57 (-46.49, -40.65) [0.000]	-43.64 (-46.56, -40.72) [0.000]
Univariate regression analysis of SE and IC with TA				
SANGINI	**Unadjusted Difference (95%CI) [p-value]**		**Adjusted Difference (95%CI) [p-value]**	
Self-efficacy (SE)	1.10, (.83, 1.38) [0.000]		1.16, (.83, 1.48) [0.000]	
Age	-.275 (-.61, .05) [0.106]		.041 (-.23, .31) [0.770]	
Education Level	-1.39 (-2.54, -.24) 0.018]		.29 (-.73,1.33) [0.567]	
ASHA	**Unadjusted Difference (95%CI) [p-value]**		**Adjusted Difference (95%CI)[p-value]**	
Self-efficacy (SE)	1.49 (1.41, 1.57) [0.000]		1.49 (1.41 ,1.58) [0.000]	
Age	-.78 (-1.10, -.47) [0.000]		.02 (-.12, .17) [0.751]	
Education Level	-1.05 (-2.32, .22) [0.105]		-.14 (-.69, .41) [0.611]	

TABLE 2 INDIVIDUAL CHARACTERS OF CHWS

SANGINI	Group (a)	Group (b)	P value
	mean±SD	**Mean ± SD**	
	n=60	**n = 30**	
Age	36.1±4.8	41±5.8	0.0001
Education Level	12.5±1.0	14.0 ±2	<0.0001
ASHA	**Group (a)**	**Group (b)**	**P value**
	mean±SD	**Mean ± SD**	
	n=180	**n = 90**	
Age	35.5±7.58	40.4±6.25	0.0001
Education Level	10.67±2.07	11.03 ±1.67	0.1201