

Developing a Conceptual Framework for Research on m Health – Testing the Efficacy of Text Messages for Maternal Healthcare

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Abstract

The UN Sustainable Goal Target 3.1 aims to reduce the global maternal mortality ratio to less than 70 per 100,000 live births by 2030. India is on the verge of achieving National Health Policy (NHP) target of 100/lakh live births by 2020 and is poised to achieve the SDG target of 70/ lakh live births by 2030. The ubiquitous nature of mobile communication and the ease of its usage have prompted the use of mobile applications in the management of diseases and promotion of healthy behaviours. In addition to promoting health education among patients and reducing waiting times and costs of healthcare, m Health enhances patient support, providing a system for emergency response and monitoring. Given that the use of mobile phones as a mode of communication in healthcare is inevitable, it is necessary to assess rural end-user perceptions and experiences with the technology. This study can be a step towards understanding the factors that would make people considers m-Health a feasible solution for their long deprived health needs. The presence of mobile phones has transformed healthcare into a patient centric, efficient and quality one. Mobile Health (m Health) technologies are widely being promoted as tools to decrease maternal and child mortality around the world. Based on the effectiveness of mobile health interventions across the world, the present study attempts to study the efficacy of text messages in improving the maternal healthcare of the expectant mothers in India.

Keywords: mobile health, maternal healthcare, SDGs, India

Introduction

The ubiquity of mobile technology allows the health care industry to address one of the pressing global challenges and also for the provision of a quality, cost friendly and accessible healthcare to the poor and the needy. In case of chronic disease management, the effectiveness of the

treatment is highly reliant on the everyday behaviour of the patient. In such situations, the interaction between the patient and the physician becomes easier with the help of mobile phones. It is understood that the healthcare scenario has become preventive rather than a corrective one and mobile phones have made the users more mindful of the health aspects with the plethora of

information available. Moreover, m health is more patient centric and accessible on demand at any point of time and place at a much lower cost. This has increased the demand and popularity of m Health in the healthcare industry.

Among the various technological innovations, m health is expected to be more effective healthcare delivery tool in terms of convenience, cost and quality. The impact of m health will be significant and alter the associations within the healthcare industry if it can meet the expectations of the consumers (Price Waterhouse Coopers, 2014). The organisations which are engaged in developing digital strategies for effective healthcare delivery are in need of clear data on consumer behaviour towards digital health solutions (Hird et al., 2016). The future of healthcare lies with the successful implementation of m health as it can make delivery of healthcare better, speedier, less costly, and customer oriented. However, the fact that mobile health is still considered to be a supplement to the primary, doctor-oriented health consultations (P. Duarte and J.C. Pinho, 2019).

At global level, healthcare challenges pose a big threat for sustainable development in addition to the hitches from the socio-economic and resource fronts. In fact, limitations in delivering healthcare to the poor and the needy badly reflect in the long term development of a nation. In India and other developing countries, the cost and accessibility factors have made quality healthcare a distant reality for the poor and needy population. As per Telecom Regulatory Authority of India (TRAI) report, there are more than 1012

million mobile subscriptions in India in November 2022. The overwhelming health necessities prevailing in the developing countries explain the need for rapid adoption of m Health in these societies.

It is a well-known fact that the field of m-Health is still in its nascent stage in many of the developing and the developed countries as well. At the same time the potential of mobile phones in the dissemination of health care for the marginalized is unquestionable. Thus, it becomes essential to understand the factors that lead to the formation of attitude towards m Health along with the effectiveness of m Health in bringing a healthier healthcare system.

Maternal Healthcare

The basic requirements for maternal healthcare vary from proper access to antenatal care during pregnancy, support from skilled assistants during childbirth to necessary support and care even after child birth. It is also very essential that all births need to be attended by proper medical professionals as the timely and efficient treatment makes a big impact in the life and death of the mother and the infant. When we look at the global maternal health scenario it becomes evident that there is a big divide between the rich and the poor, urban and rural. In some cases, the basic access to health services itself depends on the economic status and the place of residence of the mothers. More so there is a knowledge gap of the presence of health interventions and practices aimed at maternal healthcare coexisting with a dearth of resources and supporting policies for the same. In the pursuit of enhancing the maternal health and protecting the lives of women, efforts have to be taken towards

reaching the people who are more at risk like women from low economic and educational background, women from rural and urban slums, and also women from the tribal and minority communities.

Conceptual Framework for m Health research

Health care through technology can be approached in two dimensions – health and technology as such. To gauge the health behaviour of an individual several factors such as perceived usefulness, social influence, behavioural intention etc. are found to be influential. Similarly usage of technology depends on ease of use, self-efficacy, facilitating conditions and attitude towards technology.

The most important health concern of most of the developing countries, maternal health care is taken up for the study and examines the attitude of the people towards using mobile phones for accessing health services based on the constructs of the Unified Theory of Acceptance & Use of Technology (UTAUT) theory. More precisely it examines the effectiveness of text messages in creating antenatal care awareness among the expectant mothers.

The conceptual framework developed is a part of the study done to study the efficacy of mobile text messages in creates essential knowledge on antenatal care among the expectant mothers in Coimbatore, India.

The major objectives of the study are as follows:

- To examine the pre-intervention knowledge level on antenatal care among the expectant mothers.

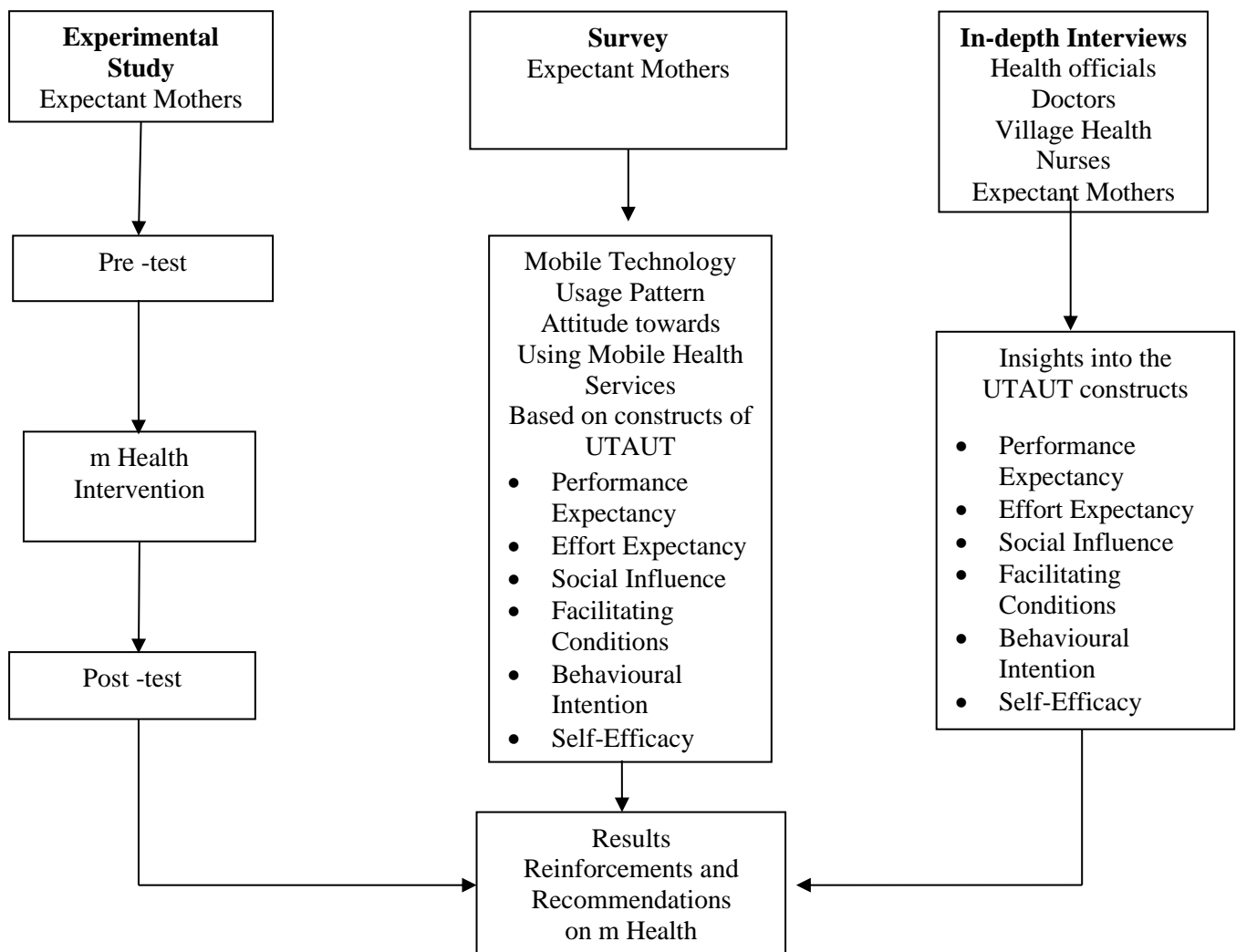
- To find out the post-intervention response level on antenatal care among the expectant mothers.
- To find out the factors that influence the people's attitude towards usage of mobile phones for health services based on the Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Behavioural Intention, Self Efficacy and Attitude.

Theoretical Background

The Unified Theory of Acceptance & Use of Technology was developed by Venkatesh et al. [2003] to present an integrated view of user acceptance and usage of new technology. The models reviewed and integrated into UTAUT include TRA, TPB, TAM, TAM2, IDT, Motivational Model, Model of PC Utilization (MPCU) and Social Cognitive Theory (SCT). It is widely established that the UTAUT has the highest power in explaining behavior intention and usage than any of the other theories as it brings the features of technology acceptance theories and behaviour change theories to understand the factors that determine behavior intentions.

The four key constructs, performance expectancy, effort expectancy, social influence, and facilitating conditions, affect intention to use of mobile phones. The key moderators in the model are gender, age, voluntariness and experience. Along with these factors, Attitude, Behavioural Intention and Self Efficacy, the indirect determinants of usage behaviour are taken as additional factors to study the attitude of the people towards using mobile phones for accessing health services.

Fig. 1. Conceptual Framework for the Study on testing the effectiveness of text messages in creating antenatal care awareness among the expectant mothers.



The study used an Explanatory Sequential Mixed Methods Approach to understand the effectiveness of the mobile phones in creating essential knowledge or awareness on antenatal care among the expectant mothers. Besides, the study helps gauge the attitude of the expectant mothers in using mobile phones for health services.

A mixed method research is used for the study which allows for a more complete understanding of the research problem as it is a combination of both quantitative and qualitative approaches (Creswell, 2014). In Explanatory Sequential Mixed Methods approach quantitative data are first

collected and the results are analysed. It is followed by the second phase using a qualitative approach to provide improved explanation beyond the quantitative results.

In quantitative research approach, we can examine the relationship among variables for testing objective theories. These variables, in turn, can be measured, typically on instruments, so that numbered data can be analysed using statistical procedures (Creswell, 2014). Hence, a Pre Experimental Study using One Group Pre-test and Post- test design was employed. This design includes a pre-test measure

followed by a treatment and a post test for a single group.

A qualitative research provides an understanding of the meaning individuals or groups ascribe to the research problem using emerging questions and procedures. As a part of the mixed methods research, the study used qualitative in-depth

As a whole, the research design for the study was done in three stages as given below



Fig. 2 Diagrammatic Representation of Research Design for the Study

Research Design

The study was conducted in Coimbatore city located in Tamil Nadu, India. Expectant Mothers visiting Primary Health Centres (PHCs) located in the rural and semi urban areas of Coimbatore were drawn as the respondents of the study.

During the Pre-test, expectant mothers who volunteered for the study were administered with a questionnaire in an interview schedule. Data including their demographic profile, mobile phone competency, mobile phone usage behaviour, sources of health information, interest in receiving the various areas of m Health, and the preferred mode of delivery for receiving health care messages were collected.

An assessment of the knowledge level of the respondents on various aspects of Antenatal Care was done with the questionnaire. In addition mobile phone numbers were collected to send intervention of Antenatal Care messages.

The intervention consisted of mobile text messages on antenatal care which were

interviews with various stakeholders of m Health, both from the demand side (patients), and the supply side (Health department officials, Doctors, and Village Health Nurses (VHNs). These interviews provided a better understanding on the existing conditions and the future perspectives of m Health in Indian context.

sent to the mobile phones numbers of the respondents of the Pre-test. The messages focused on the key areas of antenatal care such as ANC visits, immunization, scans, birth preparedness, anaemia, gestational diabetes, nutritional aspects, taking IFA and iodine supplements.

After the intervention, a post test questionnaire was administered to find out the level of increase in the Response of the respondents on antenatal care. Moreover, the respondents' attitude towards Using Mobile Phones for Health Services was assessed through statements drawn based on the various constructs of the UTAUT theory.

To add support and provide further insight into the results of pre-test and post-test, in-depth interviews with 30 stakeholders representing the demand and supply side of m Health was carried out.

Sample Selection

The expectant mothers visiting the various PHCs in the rural and semi urban areas of Coimbatore constituted the sample of the study. The expectant mothers of these

areas are less exposed to sources of health information other than the Doctors, VHNs and their own family. The need for an alternate and complementing source of health information is an essential requirement for such expectant mothers who may not be able to consult the doctors at their own convenience. The sample hence consisted of expectant mothers in need of health information and at the same time not exposed to m Health. A non-probability purposive sampling technique was used.

Sampling Procedure

In order to select the areas of study, the health department officials identified and suggested the health blocks which can be accessed by the researcher. In India, a block is identified as a zone for development comprising of 100 villages with a population of 80,000 to 1, 20,000 people (Chapter-VIII Public Health Care System of Planning Commission). Based on the number of expectant mothers registered and the convenience for access, the Primary Health Centers (PHCs) within the health blocks for the study was further narrowed down.

The researcher visited these PHCs on Tuesdays designated for maternal healthcare by the health department. The structured interview questionnaire was administered to the willing expectant mothers who were in any of the 3 trimesters and who visited the PHC on that day. The procedure was followed in all other designated PHCs and a sample of 420 willing respondents was finally arrived at. After rejection of few unfilled questionnaire, the pre-test sample was arrived at 375.

With the consent of the pre-test respondents the Antenatal Care mobile text messages were sent to all the 375 respondents for a period of one month. After a week of instituting the intervention, confirmation of the receipt of the messages was made from the respondents.

However, after the intervention, only 198 respondents could be administered with the post-test questionnaire on reasons of respondents remaining out of reach, non-visit to the PHCs and change of address. The final sample was determined to be 198.

Variables Used For the Study

The variables used for finding out the purposes of the study were the knowledge level of the respondents on antenatal care, Attitude towards using mobile phones for Health Services in terms of Performance Expectancy, Effort Expectancy, Facilitating Conditions, Social Influence, Behaviour Intention, Self Efficacy and Attitude, Demographic factors including age, type of family set up and education.

With the aim of finding out if mobile phone text messages are able to create the essential knowledge and awareness on antenatal care among the expectant mothers, the study used the demographic variables like age, education and type of family set up and the intervention messages as independent variables. The dependent variables on which the outcome of the experimental study are based on the knowledge level of the respondents on antenatal care and the attitude of the respondents in terms of the constructs of UTAUT- Performance Expectancy, Effort Expectancy, Facilitating Conditions,

Social Influence, Behavior Intention, Self Efficacy and Attitude.

Independent Variables

The age of the respondents was considered a continuous variable and hence no specific groups were formed. The respondents, the expectant mothers were found to be within the age group of 19 to 33 years. The present study categorized the education level of the respondents into four groups – Up to 10th standard, Plus two, Graduates and Post Graduates. The respondents were identified to come under two types of family set up – Joint Family and Nuclear Family.

The mobile text messages contained antenatal care aspects including registration and ANC visit, immunization, maternal anaemia, iron and folic acids, birth preparedness, gestational diabetes,

Dependent Variables

The existing awareness level of the respondents on Antenatal Care before the intervention was considered to be Knowledge level. The existing awareness level of the respondents on Antenatal Care after the intervention was considered to be Response level.

The outcome expectations of the respondents on the use of mobile phones for health services such as improved performance, timeliness and effectiveness of the messages are identified as Performance Expectancy. Effort expectancy refers to the ease of effort associated with the use of mobile phones for Health Services such as ease of operating the mobile phones and ease of comprehending the content. Social Influence refers to the respondents'

opinion of how the influence of others and society drives them to use mobile phones for health services. Facilitating Conditions are the various factors which allows for a convenient use of mobile phones for health services such as Infrastructure, network connectivity and system & language compatibility.

The features of the mobile text messages or the intervention that creates the intention to practice the Antenatal care messages sent through mobile phones during their pregnancy period is considered as Behavioural Intention. The respondents' conception of their own efficiency in operating the mobile phones on a regular basis for accessing health services is considered as Self Efficacy. The mental outlook of the respondents on the mobile phones and their usage in their lives that will determine their usage behaviour is considered as Attitude.

Tools for Data Collection

Three major tools of data collection were incorporated in the present study including Interview schedule questionnaire with open ended and closed ended questions for the Pre-test, Interview schedule questionnaire with open ended and closed ended questions for the Post-test, In-depth interviews with all the stake holders of the healthcare industry

Pre-test questionnaire

The Pre-test was conducted among the expectant mothers visiting the PHCs who volunteered to be a part of the study. The Pre-test questionnaire consisted of three sections. Section A contained questions probing the demographic information of the respondents. Section B consisted of

questions on mobile phone competency, mobile phone usage behavior, sources of health information, interest in receiving the various areas of m Health, and the preferred mode of delivery for receiving health care messages. Section C was used to assess the existing level of knowledge of the respondents on Antenatal Care before the intervention of mobile health messages.

The primary instrument developed is the Knowledge test on Antenatal Care (KTANC) which consisted on questions testing the knowledge level of the respondents on Antenatal Care. The scale was used in the Pre-test stage of the study. The instrument was developed based on the informal discussions with the Doctors and Village Health Nurses (VHNs) and based on the guidelines for Antenatal Care and Skilled Attendance at Birth by ANMs/LHVs/SNs prepared by the Maternal Health Division, Ministry of Health and Family Welfare, Government of India.

The questions testing the awareness level of the expectant mothers on antenatal care included the issues regarding Registration of Pregnancy, ANC Visits, Scan and TT injections, Folic Acid supplements, Anemia, Gestational diabetes, Foetal movements, Weight Gain, Nutritional Aspects, Signs of labour, Birth preparedness, General Advice on how to behave during pregnancy.

Intervention

The intervention of sending antenatal care messages to the mobile numbers of the respondents collected in the Pre-test was carried out for a period of one month. The instrument developed for the purpose of

the intervention was Short Messages Services (SMS) on Antenatal Care (SMSANC) which consisted of health care messages on Antenatal Care which was sent to the pre-test sample. The SMS on Ante Natal Care (SMSANC) consisted of health care messages on Ante Natal Care. The messages were developed in Tamil, the regional language to enable better comprehension by the respondents. Based on the informal discussions with the Doctors, VHNs, expectant mothers visiting the PHCs and the ANM guide published by Ministry of Health and Family Welfare, Government of India, the messages contained essential guidance for healthy pregnancy period were prepared.

In order to conform with the face validity of the health messages to be sent to the expectant mothers, opinions from the doctors, VHNs, health department officials, academicians and pregnant women were sought.

Post-test questionnaire

After the intervention of exposure to antenatal care messages for a period of one month, the post test was carried out with another interview schedule. It was designed to test the increase in the awareness level on antenatal care and also the attitude towards using mobile phones for health services.

The Post –test questionnaire contained two sections, one with questions on testing the increase in the awareness level of the respondents on Antenatal care and the second with statements for analyzing the attitude of the respondents based on the UTAUT constructs such as Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions,

Behaviour Intention, Self Efficacy, and Attitude.

The instrument developed for the study of the attitude is Attitude towards Using Mobile Phones for Health Services (ATUMPHS) which measured the attitude of the respondents towards using mobile phones for health services through various attitude statements. The scales are based on the constructs of the UTAUT theory, Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Behaviour Intention, Self Efficacy and Attitude. The construct statements were developed based on the literature review on studies with UTAUT theory and taking into consideration the characteristics of the Indian society.

The Attitude towards Using Mobile Phones for Health Services (ATUMPHS) consisted of 35 statements measuring the constructs adapted from the UTAUT theory using a 5-point Likert Scale of Strongly Agree, Agree, Neutral, Disagree and Strongly Disagree with scores of 5 to 1(descending order) for positive statements and 1 to 5 (ascending order) for negative statements.

Statistical Analysis

Statistical tools including Paired sample t-test, One-way ANOVA, Kruskal Wallis test, Mann-Whitney test and Cross tabulation were used for analysis purposes. The Paired sample t-test was used for analyzing the differences in the pre intervention knowledge level and the post intervention response levels of the respondents and find if there is a significant increase in the awareness level of the respondents on antenatal care. One-way Analysis of Variance (ANOVA) was

used to find out if age of the respondents will have a significant influence on the pre-intervention and post intervention awareness levels on antenatal care and the attitude towards using mobile phones for health services

The Kruskal Wallis test was used to find out if education of the respondents has a significant influence on the pre-intervention and post intervention awareness levels on antenatal care and the attitude towards using mobile phones for health services. The Mann Whitney test was used to find out if type of family set up of the respondents has a significant influence on the pre-intervention and post intervention awareness levels on antenatal care and the attitude towards using mobile phones for health services.

The responses of the respondents of the in-depth interviews were collated to understand the attitude towards using mobile phones for health services in terms of UTAUT constructs such as, Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Behaviour Intention, Self Efficacy, and Attitude.

Cross tabulation was used to find out if the demographic variables of age, education and type of family set up has a significant influence on the mobile phone usage pattern of the respondents including items such as ownership of mobile phones, number of years of mobile phones usage, ability to operate various features of mobile phones, their sources of health information, their interests in various areas of m Health, and preferred mode of delivery of health contents.

Conclusions

The conceptual framework discussed above can be taken as a foundation for the research studies which attempts to examine the effectiveness of mobile phones in disseminating health messages. Being a nation with one of the largest rural population in the world, India requires newer healthcare strategies for addressing the big vacuum found in its health care system. To fill the gaps found in the infrastructure, health personnel and expertise existing in the healthcare system, India needs speedy and cost effective solutions. Integrating technology driven solutions like m health to the prevailing system can make a humongous leap to the supply side of the Indian healthcare system.

While the number of programmes using mobile technologies in health care is increasing globally, there exists a significant gap in knowledge regarding its impact on health outcomes, as well as intermediary factors like access, quality, and experience. Some within the development and global health communities are demanding more research evaluating if and how m Health improves the impact in global health programs. Accordingly, generating quality evidence through methodologically rigorous research has emerged as a priority for the broader m Health community.

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