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Exploring the Use of Mobile Phones to Improve Child Health Awareness in Rural Pakistan

Abstract

Pakistan is among the countries with a considerably high rate of childhood deaths. Immediate cause for a large number of these deaths is diarrhea, pneumonia, and malaria, which can be easily prevented through health education. This study explores the effectiveness of mobile phone memory cards, also known as SD cards or external storage, to deliver video health messages in a rural community affected by floods in Pakistan. The study used a pre-post-test within group design to measure the effectiveness of mobile phones for improving health outcomes. The results of the study revealed that the provision of health information will make a difference in preventing illnesses among children under 5 by empowering parents to make informed decisions for early diagnosis. The study design relied on the training of one male Community Health Worker (CHW) who then conducted mobile phone-based health education sessions with 100 male participants. The CHW transferred educational videos to the memory cards of participants. The CHW measured participants' knowledge before and after showing the videos using a structured paper-based questionnaire. Results show a statistically significant increase in knowledge about diarrhea and pneumonia danger signs. Specifically, participants showed a statistically significant increase in knowledge about increased water-intake during diarrhea, and on the importance of seeking timely healthcare without further delays. Further, the participants were also observed sharing the videos among other members of the community through Bluetooth, however the extent of this message dissemination was not recorded. Overall, the study offers possibilities to use mobile phone memory cards for health education campaigns in low-resource settings in Pakistan. The study also offers implications to use mobile phone memory cards for other health issues such as diabetes, cancer screening, hepatitis, and mental health among others.

Keywords: *Mobile Health; Child Health; Pakistan; Memory Cards; Rural Health.*

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INTRODUCTION

Newborn mortality and rate of stillbirths is second highest in Pakistan (Rajaratnam et al. 2010; Cousens et al. 2011), relative to a global comparison. Historically, every year, 8.8 million children of age 5 and less die in Pakistan (Bhutta, Belgaumi, Abdur, Karrar, & Mouane 2006). Natural disasters and consequent displacements further overwhelm the healthcare infrastructure. According to the United Nations, the massive floods in 2010, in the Northern Areas of Pakistan, affected more people than the Indian Ocean tsunami did in 2004 and the Haitian earthquake in 2010, combined. To provide perspective, in times of natural disasters, more children die due to food shortage, lack of clean drinking water, unavailability of health care and poor sanitation/hygiene than due to the disaster itself (Tinker, & Ransom, 2002). After a disaster, a significant majority is unable to bring their life back to normal especially the most vulnerable group i.e., mothers, newborns and children. Newborns of mothers who are malnourished and receive insufficient care face even higher risks. Provision of critical health information can make a key difference in preventing diseases in children under 5 and empower parents to make informed decisions for early diagnosis and treatment. In Pakistan, male members of a household are among the key decision makers regarding health-related matters such as transportation and financial decisions related to seeking health treatment, underscoring the need to communicate with male members of the community for child health education.

Objectives:

The objective of this study is to explore the use of mobile phone memory cards to promote child health awareness in rural Pakistan. The study provides evidence for the use of entertaining-educational videos through mobile phones. Further, the study makes a significant contribution in the literature of public health technology by introducing a viable and affordable medium to reach rural community members. Additionally, the use of entertainment appeals to both younger and older audiences alike, while the ubiquitous availability of mobile phones in Pakistan offers a unique opportunity to educate the masses about preventive health issues.

In the next section, I elaborate on the theory of diffusion of innovation which guided the framework for this study. Following, I elaborate on the role of mobile phones and community health workers for community health education. Next, I present the study method, including message design, procedure and measurement and later I present the results and discussion, followed by a conclusion and limitations

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Theory of Diffusion of Innovation

This study uses the theory of diffusion of innovation (DOI) to investigate the possible spread of health messages delivered through mobile phone memory cards. The theory defines diffusion as a step-by-step process through which an innovative idea is disseminated among members, through a set of communication channels over a certain time period (Rogers, 2004). According to Rogers, diffusion of a new idea passes through four stages i.e., invention of the idea, its diffusion through the social systems, time duration, and the consequences as the information flows through social networks (Rogers, 2004). The likelihood of adoption of new ideas depends on the social networks and the role of opinion leaders among other factors. The theory also explains the decision-making process by which community members adopt a new idea. This includes *who* makes the decision and whether the decision is made freely. In the context to this study, the male participants of the community can be categorized ion the 'optional innovation-decision' category in which the individuals decide how they respond to health messages from a male Community Health Worker (CHW) which happens to be a new concept for them. As a result, the expectation is that health messages will spread in the community and the decision-making process will move to the next level of 'collective-innovative decision' in which individuals collectively make the decision to adopt or reject an innovation. At this stage, another group of decision-makers also called 'the late majority' joins the process. To achieve this step-by-step diffusion process, the study specifically aims to educate the male members of the community, in particular fathers of young children. The rationale to focus on fathers is also strategically well placed to access other members of the household. Additionally, males generally have greater access to mobile phones. Finally, most child health campaigns usually target women and ignore the role of men. To that end, this study will break new gound in terms of targeting men along with using new media and communication technologies to deliver the health message in an entertaining manner.

Mobile Phone Penetration in Pakistan

The exponential growth of mobile phones over the past decade in Pakistan offers a new avenue for the promotion of quality healthcare. Pakistan has been among the fastest growing telecommunications markets with an annual growth rate of 119 percent, and steadily growing (2000-2007). The penetration rate of mobile phone users in Pakistan has reached 68.2 percent ((PTA, 2012) with over 55 subscribers per 100 inhabitants. Availability of low-cost mobile phones and cheaper call rates further improves the use and access of mobile phones by the masses. The increase in mobile phones for healthcare (Mobile Health or mHealth) plays a critical role in empowering people to make decisions for themselves – for their own health and that of their loved ones. mHealth takes the focus of healthcare away from hospitals and directs it to people-centered care. As a result, the high prevalence of mobile phones in Pakistan

offers hope that this communication technology can be used as a tool for increased awareness among masses about newborn and child health education as well as disease prevention.

Mobile Phone Memory Cards for Health Messaging

Today many phones (not just smart phones) have the capacity to store large volumes of audio and video content in memory cards as well as disseminate information via Bluetooth sharing. The storage capacity may range from 100 MB to 4 GB even in basic-level phones. Mobile phone memory cards provide convenient access to high-quality multimedia content while maintaining the privacy to watch the content. Storing information in memory cards is particularly useful because it reduces the barrier to connect with Wi-Fi, 3G, or GPRS cellular network which may be costly and not available in rural areas. One could increase storage by inserting multiple memory cards or even store content in an external drive. Overall, mobile phone memory cards offer tangible advantages for information sharing which have largely been unused for public health awareness. However, it is important to distinguish mobile phone memory cards from other forms of information sharing for health education purposes. Multimedia Messaging (MMS) which is an alternative to memory cards, comes with challenges for disseminating health messages. First, MMS requires operators to support and provide specific settings to users, which is often complicated. Second, it requires data access for users, which is a cost-burden specifically for low-income users. Third, operators put a limit on data transfer again limiting the use by low-income users. Fourth, MMS may work for audio content but not as much for videos. Overall, MMS pose several technical and usability challenges that could restrict its adoption in a low-income rural community.

Mobile health projects across the globe that have successfully employed memory cards for health messaging in low-resource settings include:

1. The Global Health Media project produces educational videos for community health workers and for communities in low-resource areas.
2. Health Phone hosts a library of over 2,500 videos in 77 different languages that can be used for similar projects on child health education.
3. Iridium Interactive has used short video clips for entrepreneurial and health worker training in Kenya.
4. Mobenzi hosts an mHealth platform that allows health service providers to push content onto users' phones.
5. Spring Project employs pico projectors to disseminate community-made videos on nutrition and agriculture topics to women's groups in rural settings.
6. Media Matters for Women has worked on transferring audio files through Bluetooth in Sierra Leone.

7. VOTO mobile by Viamo creates IVR trees that allow users to call a specific phone number and access audio content on demand.
8. Children for Health focuses on developing children as agents of change and communicators of essential health messages in their families and communities.

Role of Community Health Workers

The role of CHWs, both skilled and semi-skilled is well established for delivering a range of health-related behavior change and preventative services in a community setting (Lassi & Bhutta, 2015). Haider and Bhutta (2009) identified significant decrease in neonatal and perinatal mortality achieved by community-based intervention including preventive and promotional interventions executed through CHWs and community mobilization activities. Community-based interventions, specifically those provided by trained health workers, have shown substantial improvement in reducing neonatal and perinatal mortality (Edmond, Kirkwood, & Tawiah, 2008). A five years' study in Gambia included 10-week training of traditional birth attendants on counseling women on ante-natal and post-natal care (Greenwood, Bradley, Byass, Greenwood, Snow, & Bennett 1990). Researchers found a significant role of trained traditional birth attendants in reducing maternal and neonatal death rates in addition to other factors such as providing transport to reach a health facility. Additionally, a randomized control trial in Greece (Kafatos, Vlachonikolis, & Codrington, 1989) measured training of nurses to deliver health and nutrition counseling. Each mother received pictured manuals to provide health information visually.

Results show that nutrition counseling improved dietary intake and improved maternal weight gain. Another study in Bangladesh explored participatory women groups and strengthening health services to improve maternal and newborn health for a population of 503163 individuals for over three years (Azad, Barnett, Banerjee, Shaha, Khan, & Rego, 2010). The results show a reduced rate of neonatal death in the intervention cluster (33.9%) compared with the control cluster (36.5%). The authors attribute these results to high population coverage and increased enrollment due to increased focus on the programme design. Overall, these studies measured community-based strategies to provide an effective and efficient method to reach at-risk populations and improve healthcare. Specifcially, these studies emphasize the important role of community health workers and trained birth attendants in improving maternal and neonatal healthcare in low-resource settings.

Research Question

What is the impact of mobile phones in improving knowledge and help-seeking behavior to treat Diarrhea and Pneumonia by male members of the household?

RESEARCH METHODOLOGY

The present study was conducted using 'discuss the education transmission mechanism'. The video messages used in this study were adopted from a globally recognized Meena Communication Initiative (MCI) developed by UNICEF (1991) using entertainment-education approach and storytelling as a method to reach audiences. The stories included adventures of *Meena*, a nine-year-old South Asian girl, her brother *Raju*, her pet parrot *Mithu*, and members of her family and the larger village community. Several studies about MCI's assessment and evaluation have been conducted including Meena Impact Study in Pakistan (1999), A National Media Study in Bangladesh (1998) and case studies in Nepal (1999); suggesting their effectiveness for social and behavior change in respective communities. In Pakistan, the stories of Meena were broadcast through National Television, public service announcements, radio programs, comic books, stickers, wall printings, posters, and banners. The stories used in this study include saving a life' (https://youtu.be/FuDFJhLCgvw) and 'Meena's three wishes' (https://youtu.be/bXzs-9SNUC4). As per our knowledge, no past study has been done to evaluate the use of these videos on mobile phones in rural Pakistan. Considering the rapid increase of mobile phones in Pakistan and extended power outages, especially in rural areas, we believe the use of mobile phones may be a significant medium of communication to deliver health messages. Furthermore, considering the low literacy rate, these videos offer substantial benefits in communicating this critical information about newborn and child health. For that purpose, we used *Meena Ki Kahani* as our central message to be delivered through mobile phone memory cards.

Participants and Procedure

100 male community members were recruited by the trained CHW. The target villages were selected based on two criteria; a) high prevalence of children-related illnesses, and b) affected by floods in the year 2011. Preference was given to families with pregnant women and children of age under-five. The Community Health Worker was trained to conduct health education sessions using mobile phones. He was literate, belonged to the local community, and spoke the native Sindhi language. The moderator was provided a mobile phone with Meena Ki Kahani videos copied in the memory card. The study used a pre-post-test within group design and was conducted in two phases. The pretest was conducted from August 18th to September 21st, 2013. The post-test was conducted from September 19th to October 21st, 2013. On average, there was 42-day difference between pretest and post-test evaluation. Phase I comprised of a pretest to assess participants' prior knowledge about childhood illnesses. This phase consisted of a structured questionnaire covering information on knowledge of danger signs for Diarrhea and Pneumonia. Phase II comprised of the post-test assessment measuring the change in knowledge and behavior after the health education sessions were administered. The survey was completed on paper.

Measurement

The study analyzed whether the use of mobile phones increase participants' level of knowledge about diarrhea and pneumonia symptoms and help-seeking behavior. The participants were evaluated on the following measures. First, participants were asked about incidence of diarrhea in the past three months in the household; response items; Yes or No. Second, participants were assessed on the knowledge of diarrhea symptoms. Sample items included: 'watery or loose stools', 'blood in stool', 'fever', 'thirst all the time', 'vomiting', and refuses to eat or drink.' Third, participants were assessed on the knowledge of symptoms for pneumonia. Sample items included: 'blocked nose', 'trouble sleeping and eating', 'fever', 'difficulty breathing', 'sputum', and 'cough.'

RESULTS & DISCUSSION

At the time of pretest, 74% participants indicated that their child suffered from diarrhea in the past three months, thus indicating the high prevalence of illness in the target community and confirming the need to conduct the intervention. A paired-samples T-test was conducted to evaluate the improvement in knowledge about diarrhea and pneumonia symptoms and danger signs. In case of knowledge about diarrhea, there was a statistically significant increase in knowledge from Time 1 or before intervention ($M = 1.94$, $SD = 1.08$) to Time 2 or after intervention ($M = 3.99$, $SD = .969$), $t(99) = -17.316$, $p < .001$ (two-tailed). The mean increase in knowledge of diarrhea symptoms was 2.050 with a 95% confidence interval ranging from -2.285 to -1.815. Furthermore, the effect size statistic (or eta squared) was 1.99; that can be understood as a correlation between the effect (i.e., educational session) and the effect (i.e., knowledge increase of diarrhea symptoms). The number 1.99 shows the proportion of variance in knowledge increase that can be attributed to the educational session. In case of pneumonia also, there was a statistically significant increase in knowledge from Time 1 ($M = 2.47$, $SD = .915$) to Time 2 ($M = 4.05$, $SD = .757$), $t(99) = -16.015$, $p < .001$ (two-tailed). The mean increase in knowledge of pneumonia symptoms was 1.58 with a 95% confidence interval ranging from -1.776 to -1.384. The eta-squared statistic (1.88) indicated a large effect size.

The study also measured an increase in knowledge about giving more to drink to a child during diarrhea. A McNemar's test was run to measure the consistency of responses across two variables i.e., increase in knowledge before and after receiving the educational session. Our aim is to test whether the treatment worked or not. Using SPSS, the McNemar's test indicated that participant's knowledge about the importance of giving more to drink changed significantly from Time 1 to Time 2 ($p < .001$). Participants were found more likely to give more to drink at Time 2 (91%) than at Time 1 (24%).

The objective of this study was to explore the effectiveness of mobile phone memory cards for improving child health awareness in a rural community of Pakistan. The study used entertaining and educational Meena Ki Kahani videos, which were pre-loaded in the mobile phones of study participants, thus removing the need of any Internet connection to watch the videos. Additionally, a trained Community Health Worker from the local community conducted the health education sessions with male participants using the videos as central point of conversation. The results showed significant increase in the knowledge among study participants in terms of danger signs and seeking healthcare for diarrhea and pneumonia. The results of this study offer a tangible contribution in a long and growing list of mobile health literature specifically in the realm of mobile phones for behavior change communication and increase in knowledge in developing countries (Gurmanm, Rubin, & Roess, 2012; Chib, van Velthoven, & Car, 2015).

The study offers a simple but effective intervention that could be replicated both within Pakistan and globally. Considering the ubiquitous access to cell phones with high storage and a reasonably large screen size, this intervention offers a viable mode to disseminate health information in remote communities, which are often hard to access due to poor data network, low-socio-economic status, or safety and security concerns. Generally, social development projects in rural areas partner with mobile shop owners to install the content in users' mobile phones through USB or Bluetooth. People visit mobile phone shops and ask for audio and video files to be loaded on their phones for a small fee. Also, in terms of cost, the use of memory cards is a viable option to deliver video messages especially in low-resource settings compared with other expensive alternatives such as GPRS, EDGE or 3G capabilities that often come with significant cost and usability challenges. Bluetooth is also used for peer-to-peer transfer of content and enables easy transfer of health messages to a large group of people with no extra cost.

CONCLUSION

With more than 5 billion subscribers worldwide, the mobile phone has become one of the most transformative tools in human history. Growth is fastest in developing countries. Use of mobile phones for health care delivery, or mHealth, is dramatically extending the reach of information to remote communities with ease, speed, completeness and accuracy. This study examined how to use mobile phone memory cards for health promotion in a developing country context. This study offers concrete implications toward improving child health in a rural setting. First, the study is family focused and elaborates on the importance of male members, especially fathers, for child health awareness in a low-income and low-resource setting. Second, the study explains how mobile phone memory cards can be used to provide health information to a population affected by natural or man-made disasters. Third, the

study employs mobile phones as a user-friendly technology to reach a less-literate audience and help them learn complex health issues in an educational and entertaining manner. Fourth, the study suggests ways for capacity building of male members of the community who in most cases are the key decision makers. Fifth, the mobile phone technology enables the CHWs to engage in a conversation with community members. This is a crucial step to assess local beliefs and practices, and gently challenge them with alternative concepts, supported by culturally appropriate and logical explanations. Finally, the conversational tone of health education sessions helps in seeking buy-in from community leaders and transforms into change agents to support the health and wellbeing of children and other family members.

Limitations

The study sample is selective and thus lacks the robustness of a randomized sampling. The findings cannot be generalized across the country as the health-related beliefs and practices may differ in other regions, although based on conjecture the basic idea would most probably remain the same. Another possible limitation is the Hawthorne effect that explains why participants may have altered their responses due to the awareness of being studied. The enthusiasm of researchers for the intervention may have influenced the participants, resulting in positive outcomes. In order to counter this, more rigorous and long-term field studies are needed to assess the effectiveness and of this approach in addition to comparing memory cards with conventional methods like flyers, brochures, radio ads, and text-messaging.

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