



“mHealth” – an important role in facilitating primary healthcare

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mHealth, the term is most commonly used in reference to using mobile communication devices, such as mobile phones, tablet computers and personal digital assistants (PDAs), and wearable devices such as smart watches, for healthcare services, information, and data collection (1). These services cover a wide spectrum from healthcare promotion, disease surveillance/prevention, epidemic outbreak tracking, acute disease treatment support and chronic disease management along with electronic payments and funds transfer.

Pakistan is a developing country with a high disease burden and mortality rate. More than half of Pakistan's population lives in rural areas with access to human resources for health (HRH) as low as 11.6 hospital staff including physicians, nurses and midwives per 10,000 population and 20 hospital beds available per 10,000 population (2). These areas not only lack quality healthcare services but also have a poor infrastructure that does not meet the health requirements of the local people situated in those hard-to-reach areas of the country. As a result, a large segment of the population has insufficient medical assistance, lack of basic awareness and monitoring, shortage of basic healthcare facilities and timely services. A recent survey suggests that as many as 29.2% of Pakistanis have no access to healthcare facilities whereas strides in telecommunication and availability of cheaper smart phones have penetrated the remote parts of the country (3). According to the recent data by Pakistan Telecommunication Authority, total teledensity was at an all-time high at 72.36% as of March 2017, with more than 139,108,964 annual subscribers and more than 39,880,053 annual 3G/4G subscribers (4). This tremendous advancement and ubiquity of mobile technology carries the potential to improve healthcare services on a colossal scale.

The majority of Pakistanis reside in rural areas with little or no access to primary healthcare facilities, let alone

specialist consultation. A recent study in a similar rural area of Bangladesh proved how mHealth applications can provide specialist diagnosis even in remote and hard to reach areas. In that mHealth-based intervention, village healthcare workers were linked with urban doctors through call centers, cases were described in detail and online consultations were received. This had the dual benefit of obtaining a specialist's diagnosis for the patients as well as boosting the health workers' medical knowledge (5).

A number of studies have been done to demonstrate the usefulness of mHealth at the national level. A randomized controlled trial was conducted in 2015, demonstrating better medication adherence in stroke survivors through short text messages (SMS4Stroke). This study suggested both practicality and efficacy of short message service (SMS) in improving medication adherence in chronic post-stroke patients in the intervention group as compared to the control group, after 2 months follow-up period (6). Another randomized controlled behavior modification trial, showed the use of mobile devices to improve diabetes care in rural areas of Pakistan. The diabetic patients in the intervention group were communicated directly at their cell phone numbers, regular counseling was done and it proved helpful in normalizing HbA1c as compared to the control group (7). Similarly, a pilot study was conducted where acceptance of hypertensive and diabetic patients towards medication reminders via phone calls and SMS was observed and it proved to be a promising option in 88% of these patients (8).

Pakistan being a low middle income country, a meager 2.6% of its gross domestic product (GDP) spent on healthcare, which is an insufficient amount to maintain current health facilities let alone initiate new ones (9). Keeping this in mind, the fact that a large population of urban and rural citizens have access to cell phones, collaborations between government health ministries and

non-governmental organization (NGO)'s can take place to reduce the ever increasing burden of communicable and non-communicable diseases through various mHealth-based applications. An example of such collaboration existed in Tanzania, another developing country with 5.6% GDP spent on healthcare, lead to fruitful results (10). Lay community workers were equipped with mobile phones containing pregnancy screening and pre-natal care applications, which they used to refer high-risk patients to other healthcare facilities. Prior to this project, only 34% of women checked into healthcare facilities compared to 68% after the pilot study, also there was an increase in awareness and reporting of danger signs amongst study participants (11).

Another obstacle in implementing mHealth in Pakistan is the country's low adult literacy rate (15 years and older) of 59.9% in 2015 as well as the use of regional languages and multi-dialects in different parts of the country (12). These can be bypassed by cellular networks and applications providing the option of regional languages and giving out audiovisual instructions in the respective language rather than written commands or announcements.

In conclusion, various mHealth applications can be used in different health-related conditions to mitigate the burden of communicable and non-communicable diseases. A large target population can be catered for through services such as SMS or robocalls to warn and instruct during an epidemic or endemic and be informed about vaccinations which would reduce the burden of communicable diseases as well as non-communicable diseases through instructions on lifestyle and behavior modifications. Patient history, lab investigations and medical imaging can be sent directly or through community workers to consultants for a better diagnosis and treatment plan. Moreover, monitoring can be done during illness and treatment in a user-friendly way that is accessible to all, making mHealth a useful application for disease awareness/education, early diagnosis and timely treatment that could be implemented on a larger scale.

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