



# A Study on Healthcare Delivery Acceptability through Mobile Phone among Rural Population

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## ABSTRACT

**Introduction:** Mobile health has great potential to expand access and improve the quality of rural healthcare.

**Objective:** Exploring the acceptability of mobile phones in healthcare interventions among rural populations of Davangere taluk.

**Methodology:** A cross sectional study was conducted among 182 mobile phone users, residing in kukkuwada village, Davangere Taluk. Data collected by house to house survey using semi-structured, pretested, and pre-validated questionnaire.

**Results:** The primary use of mobile phones among study subjects was to make or receive phone calls 182(100%). Text messaging was used by only 51(28%) of respondents. All the respondents were willing to receive health related information on their mobile phones. Out of 128(70.3%) respondents who preferred advice on vaccinations for their children 106(58.2%) preferred once in a month. 178(97.8%) were willing to make appointment with doctor via phone. Factors such as gender, literacy, employment and presence of chronic diseases affected preferences regarding mode of communication.

**Conclusion:** Mobile phone as a mean of receiving health information and supporting healthcare through mobile health interventions is acceptable in rural India.

**Keywords:** Mobile phones, Rural Population, Health care.

## INTRODUCTION

The usage of mobile phones has solved many problems in health sector which has reduced the acceptability of other information and communication technologies (ICTs) and this rapid growth has established needs for appropriate ICT interventions in developing countries.<sup>1</sup> Data used to be maintained by Telecom Regulatory Authority of India and publishes on telephone subscriptions.<sup>1</sup> India with population of 1.21 billion shown annual 32 percent growth in telephone subscriptions means 35 percent teledensity exist in rural India. Mobile phone covered many of rural households and its coverage is already been compared to already existing media like radio and television which have been used for many years in providing health awareness and it remains as the most acces-

sible ICT media in rural India for many years..<sup>1</sup>

Telehealth has greater potential to expand access and improve the quality of healthcare in rural sector.<sup>2</sup> It reduces burdens for patients, such as travel to receive specialty care, and helps improve monitoring, timeliness, and communications within the healthcare system.<sup>2</sup>

Many patients, especially those with chronic illnesses, experience difficulties in adhering to prescribed treatment. Overall rate of average adherence in treatment of chronic illnesses for longer duration are low.<sup>3,4</sup> Due to poor adherence to medication diseases cannot be treated effectively and does not come under control and this in turn leads to increased utilization of healthcare services and which in turn increases healthcare costs and reduc-

es patients quality of life.<sup>3, 5</sup> A number of interventions are tried but majority of them were found complex and ineffective.<sup>5</sup>

According to experts in the field of adherence, simple interventions, i.e., interventions that are workable in daily practice and that are easy for both professional and patient appear to be most promising in furthering patients' adherence.<sup>6</sup> Reminding patients to take their medication becomes an example for simple intervention. For the patient who are non-adherent, especially willing to take medicine but forgets or takes irregularly without maintaining timings, reminders especially help them in taking medications and hence this acts as a major barrier in majority of patients.<sup>7,8</sup>

Studies evaluating the effect of personal and thus active reminders, such as telephone calls or emails from healthcare providers to patients, revealed positive effects on adherence rates.<sup>8</sup> However, personal reminders requires an extensive time investment from healthcare providers. Electronic reminders, on the contrary, are automatically sent to patients at the appropriate time without interference of a healthcare provider.<sup>8</sup> Examples are reminder messages automatically sent to a patient's mobile phone with a short message service (SMS), an electronic reminder device (ERD) that provides patients with an audio and/or visual reminder at predetermined times, or text messages sent to patients' pager to alert them of their medication.<sup>8</sup> This type of reminding does not require additional effort from professionals and may be easy to integrate in patients' daily life. Interventions using reminders are primarily based on the principles of behavioural learning theory.<sup>8</sup>

Wireless technology is now cover 96% of global population and penetrates all walks of life and it has found a strong foothold within the healthcare sector in the emerging field of m-Health. The use of mobile phones, as a mode of communication in healthcare has become inevitable. It is necessary to assess rural end-user perceptions and experiences with technology. This would help contextualize healthcare delivery via mobile phones to 70% of country's population residing in rural India.<sup>9</sup>

## OBJECTIVES

The study was conducted to exploring the acceptability of mobile phones in healthcare interventions among rural population of Davangere taluk.

## METHODOLOGY

A Community based cross sectional study was conducted for a period of six months from June to November 2018 in rural field practice area (RHTC)

of J J M medical college, Davangere, Karnataka state of India among the residents in the study area, Kukkwada village for more than one year. Individual of more than 18 years age from each household, who owns mobile phone and who consented for the study are included and those households found locked with three consecutive visits are excluded from the study.

Sampling: Multistage random sampling was used. Kukkuwada village belonging to RHTC area of J J M medical college with the population 2800 and total of 750 households was chosen. It has been divided in to three areas according to 900 to 1000 population assigned to each ASHA worker. Area 1- includes kalleshwara badavane, shekarappa badavane, engineer quarters with the population of 952 and 256 households. Area 2- includes valmiki badavane, Ambedkar colony, Factory quarters with population of 948 and 254 households. Area 3- includes Anjaneya badavane, kollenalli road, and Bus stand with the population of 900 and 240 households. Area 3 was selected randomly and all 240 households were covered.

One individual from each household who met inclusion and exclusion criteria were taken i.e. 204 of them were willing to participate from 240 households and among 204 only 182 of them owned mobile phones. Ethical clearance from institutional ethical committee and written informed consent from the study participants were taken.

Data was collected by personal interview method using semi-structured and pre-tested questionnaire. It assessed the respondent's demographic profile, mobile phone usage pattern, and acceptability of healthcare interventions delivered via mobile phones. It includes 5 domains:

- (i) Basic functionality of the mobile phone
- (ii) Delivery and acceptability of information on health through mobile phones
- (iii) Use of mobile phones in the chronic illnesses management
- (iv) Use of mobile phones in acute illnesses management and
- (v) Acceptability of cell phones for health promotion.

**Data analysis:** Data was entered in Microsoft-Excel and analysed using SPSS version 16. Variables were described in the form of frequencies, means, and standard deviation. Chi square test and Fischer exact test were used to study associations between demography and outcome variables, i.e. (i) Preference for phone call to SMS reminders, (ii) Frequency of medication reminders in chronic illnesses, more or less and (iii) Preference for calling a doctor or healthcare personnel over mobile phone in times of acute illnesses.

## RESULTS

Of the 240 households, only 182 owned a mobile phone were enrolled in the study. The demographic details of the participants who owned a mobile phone are presented in the Table 1. Those who owned a mobile phone had a larger median family than those who did not (Median family size 5; IQR=2 V/S 5; IQR=3, p value = 0.426).

### Basic Functionality of mobile phone

Of 182 respondents 177 (97.3%) were routinely used their phones for making and receiving the calls. On average, the respondents received six calls, while eight outgoing calls were made in a day. Only 12 (6.59%) used mobile phones for listening music. (Table 2)

Of 182 respondents who owned mobile phones, 178 (97.80%) were willing to make appointment at the doctors clinic via the mobile phone and 175 (96.2%) were willing to share their contact number with their doctors. The 7 (3.8%) respondents who denied to share their contact number because of fear of misuse.

### Mobile Phone in health promotion

All the 182 respondents who owned mobile phone were open to receiving health information on mobile phones. Topics that participants preferred included information on Vaccinations, Self-care, Mother and Child health, Pregnant woman's health, Nutrition, healthy living and Information on epidemics and precautions (Table 3).

Of the 182 respondents willing to receive the information via mobile phones, majority of them 128(70.3%) were willing to receive advice on vaccinations. 5 (2.7%) preferred to receive information daily, 71 (39.0%) weekly and 106 (58.2%) monthly. Out of 182 respondents 167(91.7%) of them liked to receive alerts about vaccination days, health camps in their area. Among them a majority 144 (79%) preferred to receive vaccination reminders a day earlier to the date of vaccination, 12 (6.6%) on the day itself, 11 (6%) from a week to a month prior to the date of vaccination.

### Mobile phones in the management of chronic illness (Table 4 and 5)

For the management of chronic illness, 147 (81%) respondents preferred to receive medication adherence reminders via mobile phones. Those who refused medication reminders reported that they remembered to take their medication without reminders. From among those who preferred reminders, 138 (94%) preferred only voice calls and 9 (6.12%) preferred text messages. Most of the respondents preferred voice calls and SMSs in the local language i.e. Kannada. With increase in age

every year, the preference for less SMSs when compared to voice calls. Those who were literate in English and those currently employed were more likely to prefer SMSs alone or SMS and voice calls in comparison to those who were not literate in English and those unemployed. The result of fisher-exact test shows that there is significant difference between preference given to phone calls and SMS only in marital status, education and occupation (p value <0.05).

**Table 1: Demographic Characteristics of the of the study participants**

| Parameters            | Frequency (n=182) (%) |
|-----------------------|-----------------------|
| <b>Age (in years)</b> |                       |
| <20                   | 2 (1.1)               |
| 21-40                 | 99 (54.4)             |
| 41-60                 | 69 (37.9)             |
| >60                   | 12 (6.6)              |
| <b>Gender</b>         |                       |
| Male                  | 114 (62.6)            |
| Female                | 68 (37.4)             |
| <b>Education</b>      |                       |
| Illiterate            | 16 (8.8)              |
| Literate              | 166 (91.2)            |
| <b>Occupation</b>     |                       |
| Employed              | 132 (75.5)            |
| Unemployed            | 50 (27.5)             |
| <b>Family Size</b>    |                       |
| ≤5                    | 117 (64.3)            |
| >5                    | 65 (35.7)             |
| <b>SES</b>            |                       |
| Class I               | 56 (30.8)             |
| Class II              | 61 (33.5)             |
| Class III             | 52 (28.6)             |
| Class IV              | 13 (7.1)              |

**Table 2: Mobile phone usage pattern among study participants N=182 (multiple responses).**

| Parameters                 | Frequency (%) |
|----------------------------|---------------|
| Make or receive calls      | 182 (100)     |
| Text messaging             | 51 (28)       |
| Setting alarms             | 97 (53.3)     |
| Listening to music         | 121 (6.59)    |
| Playing games              | 41 (22.5)     |
| photography                | 72 (40.11)    |
| Accessing internet         | 22 (12.09)    |
| Make appointment to doctor | 178 (97.8)    |

**Table 3: Topics on which the study participants (N=182) preferred to receive health information on their phones (multiple responses).**

| Parameters                             | Frequency (%) |
|--|---------------|
| Information on epidemics & precautions | 11 (6.04)     |
| Self-care                              | 119 (65.38)   |
| vaccinations                           | 128 (70.33)   |
| Mother and child health                | 105 (57.69)   |
| Pregnant women's health                | 93 (51.1)     |
| Healthy lifestyle                      | 73 (39.6)     |
| Nutrition                              | 88 (48.35)    |

**Table 4: Preference for daily or less frequent medication reminders**

| Parameters            | How often                                      |   | Total (n=147) | p value |
|-----------------------|--|---|---------------|---------|
|                       | Prefer More Frequent reminders (N= 29) (19.7%) | Less More Frequent reminders (N= 118) (80.2%) |               |         |
| <b>Age (in years)</b> |  |   |               |         |
| <20                   | 2 (100)  | 0(0)  | 2(100)        | 0.080#  |
| 21-40                 | 15 (20.2)                                      | 59 (79.7)                                     | 74 (100)      |         |
| 41-60                 | 10 (16.4)                                      | 51 (83.6)                                     | 61 (100)      |         |
| >60                   | 2 (20)   | 8 (80)  | 10 (100)      |         |
| <b>Gender</b>         |  |   |               |         |
| Male                  | 19 (21.6)                                      | 69 (78.4)                                     | 88 (100)      | 0.459\$ |
| Female                | 10 (17.0)                                      | 49 (83.0)                                     | 59 (100)      |         |
| <b>Education</b>      |  |   |               |         |
| Illiterate            | 2 (15.4)                                       | 11 (84.6)                                     | 13 (100)      | 0.667#  |
| Literate              | 27 (20.1)                                      | 107 (79.8)                                    | 134 (100)     |         |
| <b>Occupation</b>     |  |   |               |         |
| Employed              | 19 (18)  | 86 (82)                                       | 105 (100)     | 0.463#  |
| Unem-<br>ployed       | 10 (23.8)                                      | 32 (76.1)                                     | 42 (100)      |         |
| <b>Family Size</b>    |  |   |               |         |
| <5                    | 15 (16.9)                                      | 74 (83.1)                                     | 89 (100)      | 0.302\$ |
| >5                    | 14 (24.1)                                      | 44 (75.8)                                     | 58 (100)      |         |
| <b>SES</b>            |  |   |               |         |
| Class I               | 13 (30.2)                                      | 30 (69.7)                                     | 43 (100)      | 0.075\$ |
| Class II              | 9 (18.0)                                       | 41 (82.0)                                     | 50 (100)      |         |
| Class III             | 5 (10.2)                                       | 44 (89.8)                                     | 49 (100)      |         |
| Class IV              | 2 (40.0)                                       | 3 (60.0)                                      | 5 (100)       |         |

# Fischer exact test, \$ chi square test.

**Table 5: Preference for voice calls only and SMS with or without voice call reminders compared to demographic characteristics**

| Parameters            | If Yes Format            |                 | Total= 147 (100) | p value |
|-----------------------|--------------------------|-----------------|------------------|---------|
|                       | Phone Call N=137 (93.2%) | SMS N=10 (6.8%) |                  |         |
| <b>Age (in years)</b> |                          |                 |                  |         |
| <20                   | 2 (100)                  | 0 (0)           | 2(100)           | 0.080#  |
| 21-40                 | 67 (90.5)                | 7 (9.5)         | 74 (100)         |         |
| 41-60                 | 58 (95.1)                | 3 (4.9)         | 61 (100)         |         |
| >60                   | 10 (100)                 | 0 (0)           | 10 (100)         |         |
| <b>Gender</b>         |                          |                 |                  |         |
| Male                  | 84 (95.5)                | 4 (4.5)         | 88 (100)         | 0.459\$ |
| Female                | 53 (89.8)                | 6 (10.2)        | 59 (100)         |         |
| <b>Education</b>      |                          |                 |                  |         |
| Illiterate            | 13 (100)                 | 0 (0)           | 13 (100)         | 0.667#  |
| Literate              | 111 (82.8)               | 10 (17.2)       | 134 (100)        |         |
| <b>Occupation</b>     |                          |                 |                  |         |
| Employed              | 98 (93.3)                | 7 (6.7)         | 105 (100)        | 0.463#  |
| Unemployed            | 39 (92.9)                | 3 (7.1)         | 42 (100)         |         |
| <b>Family Size</b>    |                          |                 |                  |         |
| <5                    | 85 (95.5)                | 4 (4.5)         | 89 (100)         | 0.302\$ |
| >5                    | 52 (89.7)                | 6 (10.3)        | 58 (100)         |         |
| <b>SES</b>            |                          |                 |                  |         |
| Class I               | 41 (95.3)                | 2 (4.7)         | 43 (100)         | 0.075\$ |
| Class II              | 47 (94.0)                | 3 (6.0)         | 50 (100)         |         |
| Class III             | 44 (89.8)                | 5 (10.2)        | 49 (100)         |         |
| Class IV              | 5 (100)                  | 0 (0)           | 5 (100)          |         |

# Fischer exact test, \$ chi square test.

Among 147(81%) who were willing to receive medication adherence reminders via mobile phones. Majority 112(76.1%) preferred a frequency of once a week and 13(8.8%) daily, 15(10%) preferred as

often as the medication was to be taken, biweekly by 7(5%). Respondents who were literate in English were more likely to prefer more frequent reminders, while those who suffered from chronic

illnesses were less likely to prefer more frequent reminders. We also found that men almost gave same preference to more frequent medication reminders in comparison to women.

### Mobile phones in the management of acute illness (Table 6)

Of the 182 respondents, 169 (93%) were willing to call their doctor using their mobile phones for the management of an acute illness and All of them, 182(100%) respondents found mobile phones beneficial during emergencies like accidents. Respondents with a formal education were more likely to call their doctor over the mobile phone in an acute illness. Further, female were less likely to prefer calling their doctor in the management of an acute illness in comparison to male.

Respondents who did not prefer calling doctor in acute illness, did not do so, either due to the prox-

imity of the hospital or because they preferred to consult a doctor in person.

### Challenges faced in using mobile phones in healthcare

Even though all the respondents were willing to receive advice or alerts on health related information few 8(4.4%) of them felt it is an intrusion into their lives because they wanted information directly from doctor or health worker by face to face conversation rather than receiving via mobile phones. From among 182 respondents, 46 (25.2%) felt that calling their doctor over the phone would disturb the doctor at work.

Prejudice, that the mobile phone has bad influence on the youth and concerns about the health hazards with the use of mobile phone, expressed by 2 of the respondents, was potential barriers to their use in healthcare.

**Table VI. Preference for calling the doctor over the mobile phone for acute illnesses compared to demographic characteristics.**

| Parameters            | Prefer to call doc for acute illness |                  | Total= 182 (100) | p value |
|-----------------------|--------------------------------------|------------------|------------------|---------|
|                       | Yes (n= 169) (92.9)                  | No (n= 13) (7.1) |                  |         |
| <b>Age (in years)</b> |                                      |                  |                  |         |
| <20                   | 2 (100)                              | 0 (0)            | 2 (100)          | 1.000#  |
| 21-40                 | 92 (92.9)                            | 7 (7.1)          | 99 (100)         |         |
| 41-60                 | 64 (92.8)                            | 5 (7.2)          | 69 (100)         |         |
| >60                   | 11 (91.7)                            | 1 (8.3)          | 12 (100)         |         |
| <b>Gender</b>         |                                      |                  |                  |         |
| Male                  | 107 (93.9)                           | 7 (6.1)          | 114 (100)        | 0.497\$ |
| Female                | 62 (91.2)                            | 6 (8.8)          | 68 (100)         |         |
| <b>Education</b>      |                                      |                  |                  |         |
| Illiterate            | 16 (100)                             | 0 (0)            | 16 (100)         | 0.637#  |
| Literate              | 153 (92.2)                           | 13 (7.8)         | 166 (100)        |         |
| <b>Occupation</b>     |                                      |                  |                  |         |
| Employed              | 124 (93.9)                           | 8 (6.1)          | 132 (100)        | 0.411#  |
| Unemployed            | 45 (90.0)                            | 5 (10.0)         | 50 (100)         |         |
| <b>Family Size</b>    |                                      |                  |                  |         |
| <5                    | 108 (92.3)                           | 9 (7.7)          | 117 (100)        | 0.699\$ |
| >5                    | 61 (93.8)                            | 4 (6.2)          | 65 (100)         |         |
| <b>SES</b>            |                                      |                  |                  |         |
| Class I               | 53 (94.6)                            | 3 (5.4)          | 56 (100)         | 0.608#  |
| Class II              | 56 (91.8)                            | 5 (8.2)          | 61 (100)         |         |
| Class III             | 47 (90.4)                            | 5 (9.6)          | 52 (100)         |         |
| Class IV              | 13 (100)                             | 0 (0)            | 13 (100)         |         |

# Fischer exact test, \$ chi square test.

## DISCUSSIONS

### Mobile phone-based reminders

A majority of respondents expressed their interest in receiving medication adherence reminders for chronic illnesses. Likewise in our study also respondents expressed an interest in receiving medication adherence reminders, appointment reminders and vaccination reminders. Similar finding were found in study done in rural Haryana where mobile phones were used repeatedly to take appointments of doctor.<sup>10</sup>

### Preferred type of communication: SMS versus Voice calls

In our study, most of the respondents preferred voice calls and SMSs in the local language i.e. Kannada. With increase in age every year, the preference for SMSs was less when compared to voice calls. Those who were literate in English and those currently employed were more likely to prefer SMSs alone or SMS and voice calls in comparison to those who were not literate in English and those unemployed. In a study from Mumbai, India re-

ported that only a few women at an urban antenatal clinic were found using the SMS facility. The reasons were low literacy levels and even among the literates, difficulty in reading or handling text messages.<sup>11</sup> Similar technical difficulties were reported in responding to both IVR calls and SMS reminders in a study from South Africa.<sup>12</sup> Older respondents preferred voice calls over SMSs as a mode of medication reminders. The probable cause given was discomfort in operating mobile phones and access an SMS or a difficulty with reading SMSs. It is similar to our study where many some of our respondents preferred phone calls over SMSs technology because found cumbersome to use.<sup>13</sup> Though SMS technology had greater appeal among those who are literate in English, but maintaining communication in the local language could make them more accessible to those who are literate only in the local language. It is also worth noting that though the language maybe different, the script of communication is frequently English.<sup>13</sup>

### Frequency of reminders

In our study majority of the study participants preferred less frequent reminders. Goldstein MP, et al. in their study conducted in resource limited setting on role of mobile phone technologies in improving adherence to antiretroviral treatment: a randomized controlled trial reminders in the form of text message found that while language and format preferred are obvious issues, increased frequency of reminder was a significant cause of intervention fatigue and therefore needs attention.<sup>14</sup>

### Mobile phones usage in acute care and epidemics

A study from Nakuru, Kenya demonstrated and showed that mobile phones were useful in facilitating communication and decision-making in reproductive health.<sup>15</sup> This may be due to quicker communication and easier access to information in an emergency. Such use of mobile phones especially benefit rural India, where patients must travel long distances to meet a doctor frequently, not only for basic health requirements but also in emergencies. The possibility of using emergency helplines could also be explored in this setting which helps in providing verbal basic or professional assistance.<sup>15</sup> However for the population in our study, accessing healthcare in an emergency may not be a significant issue if provided with primary and a secondary level healthcare facility in the village. In our study, those with formal education preferred to contact their doctor via mobile phone, for acute and emergency care.

Limitations of our study include, most of the respondents are male in our study with access to mobile phones. In Indian context, women are more responsible for health and hygiene in their family.

Only one area has been taken for study so may pose for geographical limitation. Younger generation will have more affinity towards mobile phones and technologies but in our study only 2 participants are of <20 years of age so our sample represents older population.

### CONCLUSION

M-health interventions in the form of reminders and information providing applications through mobile phones were accepted in our study. Phone calls was the most preferred mode of communication and this needs to be considered in the light of popularity of SMS globally. While language and format are obvious issues, overall preferring for the decreased frequency of reminders does not cause intervention fatigue. Attention to factors such as English literacy, education, employment status, and sex of end user would only serve to improve the efficacy of m-health.

### Recommendations:

Healthcare providers and mobile users should get expertise in mobile phone operation so, that they stay updated with health information available and make better utilization and they also become aware of health situations that require attention by health professionals. Automated voice calls or line help lines should be used for getting health information. Script of communication should be in local language so that it can be easily accessible to those literate in local language.

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