

Access this article online

Quick Response Code:



Website:  
[www.jehp.net](http://www.jehp.net)

DOI:  
10.4103/jehp.jehp\_406\_22

# Sub-optimal knowledge with positive attitude and belief of frontline health workers toward the use of information technologies: A mixed-method study from rural Haryana, India

Ramadass Sathiyamoorthy, Ankit Chandra<sup>1</sup>, Sagar Poudel<sup>1</sup>, Rakesh Kumar<sup>1</sup>, Harshal R. Salve<sup>1</sup>, Kapil Yadav<sup>1</sup>, Shashi Kant<sup>1</sup>, Ballabgarh Teaching and Research Group<sup>1\*</sup>

Department of Community Medicine, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry, India,  
<sup>1</sup>Centre for Community Medicine (CCM), All India Institute of Medical Sciences (AIIMS), New Delhi, India

\*Ballabgarh Teaching and Research Group

1. Chitrangada Mistry
2. Trideep Jyoti Deori
3. Abhishek Jaiswal
4. Pragyan Paramita Parija
5. Alok Kumar
6. Vignesh D.
7. Girish Jeer
8. Preety
9. Aditi Mohita
10. Archismita Santra
11. Aninda Debnath
12. Surabhi Puri
13. Vignesh L

## Address for correspondence:

Dr. Kapil Yadav,  
Centre for Community Medicine (CCM), Old OT Block, All India Institute of Medical Sciences (AIIMS), New Delhi - 110 029, India.

E-mail: [dr.kapilyadav@gmail.com](mailto:dr.kapilyadav@gmail.com)

Received: 16-03-2022

Revised: 06-07-2022

Accepted: 07-07-2022

Published: 28-12-2022

## Abstract:

**BACKGROUND:** Information technology (IT) can be used by frontline health workers (FLWs) to connect and deliver care to the community. Various studies in India have assessed the beneficial impact of IT usage by FLWs, but for the long-term sustainability, the attitude and belief toward IT usage have not been adequately studied. We conducted this study to assess the knowledge and attitude and to explore the beliefs of FLWs toward the use of IT in a rural area of Haryana.

**MATERIALS AND METHODS:** We conducted a mixed-method study (qualitative and quantitative approach) in a rural setting of Haryana, India. We included FLWs of two primary health centers (PHCs). Data were collected from October 19, 2020 to December 31, 2020. We collected data from 75 accredited social health activists (ASHAs), 37 Anganwadi workers (AWWs), 28 multi-purpose workers (MPWs), two information assistants, and two medical officers using a semi-structured interview schedule. Their knowledge about the benefits of IT use, past use of IT applications and devices, and self-rating of knowledge regarding computers or laptops were collected. We used 14 attitude statements, each with a five-point Likert scale to assess the attitude; a total score  $\geq 35$  was considered a positive attitude. We conducted eight focus group discussions (FGDs) to explore the beliefs regarding IT usage (four FGDs with ASHAs, two FGDs with AWWs, and two FGDs with MPWs). A descriptive analysis was performed for the quantitative data, and a thematic analysis was performed for qualitative data.

**RESULTS:** Knowledge about the benefits of IT use was present among 77.8% of FLWs. Among the FLWs, 79.2% self-rated their knowledge of computers/laptops as 'do not have knowledge', 16% self-rated as 'low knowledge', and 4.8% self-rated as 'good knowledge'. The median total score for attitude statements among all the FLWs ( $n = 144$ ) was 54 [inter-quartile range – 48–59]. Four themes emerged for beliefs toward IT usage, namely, positive beliefs, negative beliefs, challenges anticipated in adopting IT use, and facilitation factors. The positive beliefs were related to improvement in work efficiency and social status, less paperwork, timely report generation, and better learning. The negative beliefs were related to an increase in working hours, close monitoring, and feeling over-burdened.

**CONCLUSION:** We found that FLWs had knowledge regarding the benefits of IT use, but they lacked knowledge regarding laptop/computer use. They had a satisfactory level of confidence in using smartphones, and most of them were using mobile applications. The majority of the FLWs had a positive attitude and beliefs toward IT use and wanted to use it in the future.

## Keywords:

Attitude, health, information technology, knowledge

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: [WKHLRPMedknow\\_reprints@wolterskluwer.com](mailto:WKHLRPMedknow_reprints@wolterskluwer.com)

**How to cite this article:** Sathiyamoorthy R, Chandra A, Poudel S, Kumar R, Salve HR, Yadav K, *et al.* Sub-optimal knowledge with positive attitude and belief of frontline health workers toward the use of information technologies: A mixed-method study from rural Haryana, India. *J Edu Health Promot* 2022;11:419.

## Introduction

Information Technology (IT) is defined as the study or use of systems (especially computers and telecommunications) for storing, retrieving, and sending information (including the use of mobiles/tablets, computers/laptops).<sup>[1]</sup> The use of IT in primary health care can be in the form of mHealth to collect data, connect with community or co-workers, receive alerts or reminders, improve the coverage, and deliver health care services.<sup>[2]</sup> The mobile phone-led programs (mHealth) are being developed to tackle health care issues such as immunization, tuberculosis, and malaria in the low- and middle-income countries.<sup>[3,4]</sup> Successful mHealth interventions have shown improvements in antenatal care attendance in Rwanda and Nigeria, infant growth monitoring in Kenya, and breastfeeding in Malawi and China.<sup>[5-7]</sup> Common areas of application of mHealth tools include point-of-care decision-making support, communication, improved service delivery, and data collection.<sup>[8,9]</sup>

Frontline health workers (FLWs) are the workers from the community; they serve and play a critical role in providing health services. They also form a connecting link between the health system and the community.<sup>[10]</sup> In the Indian context, FLWs include accredited social health activists (ASHAs), Anganwadi workers (AWWs), and multi-purpose workers (MPWs). FLWs have various roles and functions. They contribute to the continuum of care by addressing a variety of issues such as family planning, maternal health, newborn care, infant feeding, and immunization. They have the potential to enhance primary access and quality.<sup>[11]</sup> Several studies in India have demonstrated the use of IT by FLWs to improve their work efficiency.<sup>[12-14]</sup> However, still, the use of IT by FLWs in India is limited, and the challenge remains the long-term sustainability.<sup>[15]</sup> Studies have looked at the beneficial impact of IT usage by the FLWs in the community, but the attitude and belief toward IT usage have not been adequately studied.<sup>[14,16,17]</sup> It is a common practice for authorities to plan and implement changes in health care without knowing the attitude and perception of intended end users. Health workers may find themselves being compelled to adopt changes. This leads to resentment and resistance leading to the slowed or unsuccessful realization of the change.<sup>[18]</sup> The acceptability and use of IT depend on the perceptions and attitudes of FLWs toward it. Information on the knowledge, attitude, and belief of health workers toward IT may improve the efficiency of the health system. Currently, there is only a handful of published literature on this. Therefore, we carried out this study to assess the knowledge and attitude and to explore the beliefs of FLWs toward the use of IT in a rural area of Haryana.

## Materials and Methods

### Study design and setting

This was a mixed-method study using a quantitative and qualitative approach. It was conducted in a rural area of the district Faridabad, Haryana. Data were collected from October 19, 2020 to December 31, 2020.

### Study participants and sampling

The study participants were all FLWs, that is, ASHA workers, AWWs, MPWs, Information Assistants (IAs), and medical officers (MOs) of two primary health centers and their associated 12 sub-centers. FLWs that were not contactable after two attempts were excluded from the study.

### Data collection and analysis

We used a quantitative approach to assess the knowledge and attitude of the FLWs. All participants were interviewed face to face using a semi-structured interview schedule. The interview schedule was self-developed and pretested. The interview schedule contained the questions regarding socio-demographic profiles, knowledge about the benefits, the purpose of the data collected, people who would use collected data, past use of IT applications or devices, use of WhatsApp/YouTube/Gmail/Google, and preference for a future IT application. There were 14 attitude statements, each with a five-point Likert scale. The responses were rated from 1 to 5, strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1). Question numbers 3 and 5 were negatively framed; therefore, response ratings for these questions were reversed during analysis. The total score for attitude ranged from 14 (minimum) to 70 (maximum). A total score of  $\geq 35$  was considered a positive attitude. For the analysis, we grouped the attitude statements into three categories: attitude toward IT devices (five statements; score range – 5 to 25), attitude toward IT usage and acknowledging its importance (five statements; score range – 5 to 25), and attitude toward IT learning and future use (four statements; score range – 4 to 20) (Annexure 2 of the supplementary document). Participants were asked to self-rate their knowledge on computer/laptop usage as do not have knowledge, low knowledge, and good knowledge. Participants were also asked to self-rate their confidence in the use of a mobile, tablet, computer, and laptop on a scale of 0 to 10, where 0 was the lowest score and 10 meant the highest score. The quantitative data were collected on a paper form, which was entered into Microsoft Excel using Google forms. The quantitative data analysis was performed using R software. A descriptive analysis was performed for the variables among the sub-groups by designation of participants. The results were presented in proportions, mean [standard deviation (SD)], and median [inter-quartile range (IQR)].

We used a qualitative approach to explore the beliefs regarding IT use. The data were generated through eight focus group discussions (FGDs) using a guide, four FGDs with ASHAs, two FGDs with AWWs, and two FGDs with MPWs. We selected participants for FGDs using purposive sampling who were available and willing to participate. The groups were homogeneous, and there were six to eight members in a group. The FGD sessions were audio-recorded and transcribed verbatim in Hindi (the local language). The anonymity of the participants was maintained. Audio recordings were deleted following the transcription. Data were stored in password-protected systems with limited access. We did thematic analysis for generated data. Data collection and analysis for the qualitative part were performed in the local language. All the transcriptions were sorted, categorized, and coded manually. The coding was performed by two authors. Any disagreement was resolved by consensus, involving other authors. The codes were categorized into domains and categories to identify the meaningful themes.

### Ethical consideration

Ethical clearance was taken from Institute Ethics Committee (Ref. No. – IEC606/03.07.2020), and informed written consent was obtained from all the participants.

## Results

We interviewed a total of 144 FLWs, that is, 75 ASHAs, 28 MPWs, 37 AWWs, 2 IAs, and 2 MOs. The majority of the FLWs were females (95.1%), and 46.5% were in the age group of 35–44 years [Table 1]. The mean age of FLWs was 40.5 years (SD – 7.7), and the mean years of education

**Table 1: Distribution of FLWs by socio-demographic variables (n=144)**

Variable	Frequency (%)
Sex	
Male	7 (4.9)
Female	137 (95.1)
Age group (in years)	
25-34	34 (23.6)
35-44	67 (46.5)
45-54	38 (26.4)
55-69	5 (3.5)
Occupation	
Accredited Social Health Activist (ASHA)	75 (52.1)
Multi-purpose Worker (MPW)	28 (19.4)
Anganwadi Worker (AWW)	37 (25.7)
Information Assistant (IA)	2 (1.4%)
Medical Officer (MO)	2 (1.4%)
Years of education	
8-10	69 (48.6)
11-12	38 (26.7)
13 or more	35 (24.7)

were 11.7 years (SD – 2.6) [Annexure 1]. FLWs who were aware of any mobile application related to data collection or entry (e.g., Epi info, Epicollect, ANMOL, eVIN,) were 10.4%. FLWs who had used WhatsApp were 113 (78.5%), mainly for communication and official work. Among the WhatsApp users, 92% of them (n = 104) used WhatsApp every day. FLWs who had used Gmail were 20 (13.9%), mainly for communication and official work. Among the Gmail users, 50% of them (n = 10) used Gmail every day. FLWs who had used Google were 46 (31.9%), mainly to get information. Among the Google users, 52.4% of them (n = 33) used Google every day. FLWs who had used YouTube were 59 (40.9%), mainly for entertainment. Among the YouTube users, 66.1% of them (n = 39) used YouTube every day [Table 2].

### Knowledge

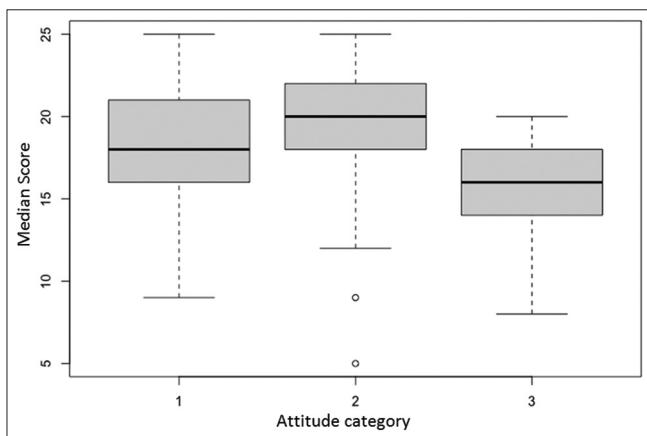
Among the FLWs, 77.8% (n = 112) of them had knowledge about the benefits of IT use. FLWs who were aware of 'who can use the collected data' were 65.3% (n = 144). FLWs who had knowledge regarding the purpose of data collection were 66% (n = 95). FLWs who used to access the internet through mobiles were 52.1% (n = 75). Among the FLWs, 39.6% (n = 57) accessed health-related information. Only 15.2% (n = 22) of FLWs were ever trained in computer basics/software. The total number of FLWs who had ever used a computer or laptop was 27 (18.8%). Among them, 70.4% (n = 19) most often used it at their home; 66.7% at work and 3.7% at cybercafé. Among the ever users, the median years of computer/laptop use were 5 years (IQR 2–10). Among the FLWs (n = 144), 79.2% self-rated their knowledge of computers/laptops as 'do not have knowledge', 16% as 'low knowledge', and 4.8% as 'good knowledge'. The median score for confidence in using a mobile was 5 (IQR 4–7.5).

### Attitude and preference for future IT use

The attitude was overall positive for all the FLWs. The median total score for the attitude statement was 54 (IQR – 48–59). The median total score for attitude statements among ASHAs, AWWs, MPWs, IAs, and MOs was 53 (IQR 48–58), 54 (IQR 50–64), 54.5 (IQR 46.5–60), 64.5 (IQR 63–66), and 58 (IQR 55–61), respectively. The median score for the attitude toward IT devices was 18 (IQR 16–21). The median score for the attitude toward IT usage and acknowledging its importance was 20 (IQR 18–22). The median score for the attitude toward IT learning and future use was 16 (IQR 16–18) [Figure 1]. Among the FLWs, 98.6% wanted to use IT in future for their work. The majority of them wanted a smartphone (72.9%) for conducting a survey (72.9%), the typing language as the local language/Hindi (50%), a screen size of the device to be more than 10 inches (31.9%), and antenatal care services (95.1%) [Table 3].

**Table 2: Distribution of FLWs by their knowledge and usage of IT devices and applications**

Variable	ASHAs (n=75)	AWWs (n=37)	MPWs (n=28)	IAs (n=2)	MOs (n=2)	Total (n=144)
Benefit of IT use	51 (68%)	32 (86.5%)	25 (89.3%)	2 (100%)	2 (100%)	112 (77.8%)
Who can use the collected data	33 (44%)	32 (86.5%)	25 (89.3%)	2 (100%)	2 (100%)	94 (65.3%)
Purpose of data collection	38 (50.7%)	28 (75.7%)	25 (89.3%)	2 (100%)	2 (100%)	95 (66%)
Use of mobiles to get access to internet	21 (28%)	27 (73%)	23 (82.1%)	2 (100%)	2 (100%)	75 (52.1%)
Use of internet to get health information	12 (16%)	19 (51.4%)	22 (78.6%)	2 (100%)	2 (100%)	57 (39.6%)
Ever trained in computer basics/software	3 (4%)	6 (16.2%)	12 (42.8%)	2 (100%)	1 (50%)	24 (16.7%)
Ever used computer or laptop	3 (4%)	7 (18.9%)	13 (46.4%)	2 (100%)	2 (100%)	27 (18.8%)
Median (IQR) years of computer/laptop use among ever users	5 (4-6)	0.5 (0.25-1)	7.5 (3-23)	8 (6-10)	14 (10-18)	5 (2-10)
Self-rating of computer/laptop knowledge						
Do not have knowledge	69 (92%)	30 (81.1%)	15 (15.6%)	0 (0%)	0 (0%)	114 (79.2%)
Low knowledge/Beginner	5 (6.7%)	6 (16.2%)	12 (42.9%)	0 (0%)	0 (0%)	23 (16%)
Good knowledge/Master	1 (1.3%)	1 (2.7%)	1 (3.6%)	2 (100%)	2 (100%)	7 (4.8%)
Median (IQR) score for confidence in using a device (self-rated)						
Mobile	4 (3-5)	5 (4-7)	8 (5-10)	9 (9-9)	8.5 (8-9)	5 (4-7.5)
Tablet	0 (0)	0 (0)	0 (0)	8 (8-8)	8.5 (8-9)	0 (0)
Computer	0 (0)	0 (0)	0 (0-4)	8 (8-8)	8.5 (8-9)	0 (0)
Laptop	0 (0)	0 (0)	0 (0-1)	8 (8-8)	8.5 (8-9)	0 (0)
Number of WhatsApp, Gmail, Google, and YouTube users						
WhatsApp Users	45 (60%)	36 (97.3%)	28 (100%)	2 (100%)	2 (100%)	113 (78.5%)
Daily WhatsApp Users (% out of users)	37 (82.2%)	35 (97.3%)	28 (100%)	2 (100%)	2 (100%)	104 (92%)
Gmail Users	1 (1.4%)	6 (16.2%)	9 (32.1%)	2 (100%)	2 (100%)	20 (13.9%)
Daily Gmail Users (% out of users)	0 (0%)	0 (0%)	6 (66.7%)	2 (100%)	2 (100%)	10 (50%)
Google Users	9 (12%)	14 (37.8%)	19 (67.9%)	2 (100%)	2 (100%)	46 (31.9%)
Daily Google Users (% out of users)	6 (66.7%)	8 (57.1%)	16 (84.2%)	2 (100%)	1 (50%)	33 (52.4%)
YouTube Users	16 (21.4%)	20 (54%)	19 (67.9%)	2 (100%)	2 (100%)	59 (40.9%)
Daily YouTube Users (% out of users)	10 (62.5%)	11 (55%)	14 (73.7%)	2 (100%)	2 (100%)	39 (66.1%)



**Figure 1:** Median scores for the attitude statements toward the use of IT. 1 – Attitude toward IT devices, 2 – Attitude toward IT usage and acknowledging its importance, 3 – Attitude toward IT learning and future use

In the qualitative analysis, four themes emerged for beliefs toward IT use, positive beliefs, negative beliefs, challenges anticipated in adopting IT use, and facilitation factors [Table 4].

**Theme 1: Positive beliefs**

**Increase in work efficiency**

In the positive beliefs, FLWs felt that IT use will increase their work efficiency and their work.

*“Weight monitoring of children will become proper” – a 38-year-old AWW*

**Ease of work**

One AWW said that the weight monitoring of children will become better, whereas another AWW mentioned that it will become easy to distribute rations.

*“We need to learn new technologies” – a 29-year-old ASHA*

**Felt the need for updating oneself with technology**

FLWs also believed that there is a need to update themselves with the newer technology. Most of the young ASHAs agreed with their colleague and supported this.

*“a smartphone will increase our social status” – a 42-year-old ASHA*

**Perceived as a status symbol**

A smartphone was also perceived as a status symbol. They felt that using a smartphone will help them to update their social status.

**Less paperwork**

They felt that the use of IT will reduce their paperwork. They also mentioned the problem of maintenance of registers as rats chew off registers and that there are

**Table 3: Distribution of FLWs by their preference for future IT devices and application**

Variable (n=144)	Number (percentage)
Do you want to use IT in future?	
Yes	142 (98.6)
No	2 (1.4)
Preferable device (multiple options)	
Smartphone	105 (72.9)
Tablet	51 (35.4)
Laptop	23 (16.0)
Computer	2 (1.4)
Purpose of use of IT (multiple options)	
Conducting survey	105 (72.9)
Report generation	78 (54.2)
Data collection	71 (49.3)
Data storage	58 (40.3)
Generating work plan	53 (36.8)
Do not know	10 (7.0)
Comfortable typing language	
Hindi	72 (50.0)
English	32 (22.2)
Hindi and English	30 (20.8)
Hindi language using the English alphabets	8 (5.6)
Did not answer	2 (1.4)
Minimum screen size of the device	
4-5 inch	3 (2.1)
5.1-6 inch	20 (13.9)
6.1-7 inch	37 (25.7)
8.1-9 inch	17 (11.8)
9.1-10 inch	21 (14.6)
>10 inch	46 (31.9)
Purpose for using an application (multiple options)	
Antenatal care	137 (95.1)
Immunization coverage	132 (91.7)
Home visit of workers	127 (88.2)
High-risk pregnancies	126 (87.5)
Anemia	108 (75.0)
Tuberculosis	98 (68.1)
NCD patients	96 (66.7)
Education	21 (14.7)
Growth monitoring	18 (12.5)
Ratio distribution	14 (9.7)

more than 18 registers to take care of. They appreciated the benefit of IT as paperless work. They also mentioned that they would not have to carry the registers to the field. They wanted to carry a single smartphone to the field.

*“Rats chews off our registers and there are more than 18 registers” – a 39-year-old MPW*

### Timely report generation and accurate appraisal

Few ASHAs mentioned that for report generation, they had to seek help from their family members such as children or daughters-in-law. IT usage will solve their problems for making reports and appraisals. ASHAs felt that if the work is performed digitally, then it will

become easy for them to prepare their remuneration claims. The report will be prepared immediately. Timely report generation was also mentioned by an MPW who said that the immunization due list will be ready on time.

*“Whenever we are unable to prepare a report, we call our children for help” – a 46-year-old ASHA*

### Audio-visual learning

ASHAs mentioned that IT usage will help them in learning through audio-visual systems.

### Optimistic attitude

The FLWs had an optimistic attitude toward IT usage as they mentioned that initially, it will be difficult to learn, but later, it will be easy.

*“Initially it will be difficult to learn, later will be easy to use” – a 37-year-old ASHA*

### Theme 2: Negative beliefs Increase in working hours

Few FLWs had negative beliefs about IT usage. One MPW mentioned that because of IT usage, they will have to carry on their work at home. It will lead to an increase in their working hours.

*“Our duty will be 24 hours” – a 39-year-old MPW*

### Close monitoring

They also mentioned the disadvantage of IT usage. It would facilitate their supervisors to closely monitor their work progress and punctuality at work. They said that our superiors may even ask them to send their location coordinate.

*“Our monitoring will be done by asking our location” – a 40-year-old MPW*

### Eye straining

One AWW mentioned the side effect of IT use as eye strain.

*“The number of our spectacles will increase” – a 36-year-old AWW*

### Lack of time and feeling over-burdened

FLWs also mentioned that they did not have time for learning new things. They felt over-burdened like a donkey.

*“We don’t have time for learning new things” – a 38-year-old ASHA*

### Theme 3: Challenges Battery and network issues

There were some challenges anticipated by the FLWs in adopting IT use. One was the battery of the device and network issue for communication. They said that their

**Table 4: Themes generated toward the use of IT among the FLWs**

Positive beliefs	Negative beliefs	Challenges anticipated in adopting IT Use	Facilitation factors
Increase in work efficiency	Increase in working hours	Battery and network issues for the device	Vigorous training and supportive supervision
Ease of work	Close monitoring	Risk of the device getting stolen and data loss	Free device and services
Felt the need of updating oneself with technology	Eyestrain	Old age and low education	Large screen size
Perceived as a status symbol	Lack of time and feeling overburdened	Unwanted phone calls	Local language (Hindi) for typing
Less paperwork		Increased dependency on smartphones for work	Paperwork as an alternate option
Timely report generation and accurate appraisal for work			
Audio-visual learning			
Optimistic attitude			

smartphone battery may not last long and may face network issues in the field.

*“Battery will drain, and network are not available” – a 36-year-old MPW*

#### Risk of the device getting stolen and data loss

They also mentioned that there was the risk of losing data and smartphones. An AWW said that at home, their children may delete the data or application while playing or using the smartphone. They also mentioned that a smartphone can be easily stolen.

*“Mobile phone can be stolen” – a 40-year-old AWW*

#### Old age and low education

They believed that old age and low education of workers can be a barrier to IT use. A young ASHA said that the old-age workers who are educated up to the 8<sup>th</sup> standard may not be able to use a smartphone.

*“Older people and people educated up to 8<sup>th</sup> standard will not be able to learn it” – a 30-year-old ASHA*

#### Unwanted phone calls

A young female MPW said that they may get numerous unwanted phone calls and may face problems in sharing their mobile number in the community and then a few people may bother them unnecessarily.

*“Our contact number will get distributed to people, then people will bother us” – a 38-year-old MPW*

#### Increased dependency

They also anticipated the risk of higher dependency on the smartphone as when a smartphone becomes non-functional, then it will halt work till the phone is repaired.

*“When the mobile is broken, then our work will halt” – a 39-year-old MPW*

#### Theme 4: Facilitation factors

##### Vigorous training and supportive supervision

There were facilitator factors identified for the IT usage by FLWs in a health care setting. They mentioned that

vigorous training and supportive supervision will motivate and will provide an enabling environment for it.

*“Train us, until we master it” – a 40-year-old ASHA*

##### Free device and services

They mentioned that the smartphone and Subscriber Identification Module (SIM) card should be provided by the government with unlimited talk time and internet access. An MPW said that another option for providing internet access could be by setting up a Wireless Fidelity (WIFI) connection at the sub-center.

*“Smartphones should be provided by the government” – a 42-year-old MPW*

##### Large screen and local language for typing

An old age ASHA said that the screen of the IT device has to be bigger so that the text is legible. Another ASHA said that the typing language for the IT application should be in their mother tongue (Hindi language).

*“Hindi is our mother tongue. How can we read in English?” – a 36-year-old ASHA*

##### Paperwork as an alternate option

They also suggested keeping paperwork as an alternative option for those workers who may not be able to use an IT device.

*“Provide an option for paperwork for those who are unable to use a smartphone” – a 42-year-old ASHA*

## Discussion

We found that majority of the FLWs had knowledge regarding the benefits of IT use, which was similar to the finding of Ghoochani *et al.*<sup>[19]</sup> This knowledge could be dependent on the education level of the FLWs. However, FLWs lacked knowledge and confidence in using a device, which could be due to a lack of past use/training, but had a positive attitude and belief toward IT use. These findings were similar to the findings of

Ghoochani *et al.*,<sup>[19]</sup> Ilozumba *et al.*,<sup>[20]</sup> Sukum *et al.*,<sup>[21]</sup> and Kipturgo *et al.*<sup>[22]</sup>. A substantial number of FLWs were using applications such as WhatsApp, which was mainly introduced to them by their friends or colleagues for work/communication. A few FLWs had negative beliefs regarding IT use as they thought that it would over-burden them and facilitate their superiors to monitor them. This finding was similar to Peters *et al.*<sup>[23]</sup> because our study setting was rural, most of the FLWs anticipated network issues as a challenge in adopting IT use. To promote IT use among FLWs providing a device with internet access is an elemental step toward providing a conducive environment for IT use. A study in Gujarat has shown that providing a device with internet access, training, and supportive supervision was effective for the adherence to IT use by the FLWs.<sup>[14,24]</sup> A systematic review has demonstrated that the use of mobile health intervention by health workers may have limitations pertaining to internet, electricity, and security issues, but its utility and benefits in a low-resource setting out-weigh the limitations.<sup>[25]</sup>

India had launched the 'Digital India Programme' to ensure that the Government's services are made available to citizens electronically by an improved online infrastructure. It envisages transforming India into a digitally empowered society.<sup>[26]</sup> Our finding suggests a positive attitude and belief of FLWs toward IT use. This can expedite the progress toward the implementation of the digitalization of health services. We found that the majority of the FLWs had a satisfactory level of confidence in using a mobile device and were using the WhatsApp application. Therefore, in the future, health-related digital interventions can be planned using smartphones for the FLWs. The explored negative beliefs and anticipated challenges in IT use can be addressed by providing appropriate technology and infrastructure support. The strength of the study was that we collected data and performed the qualitative data analysis in the local language. We used triangulation of the data sources and methods to assess the attitude and explore the beliefs of the FLWs.

### Limitation and recommendation

The limitation of our study was that we did not assess the reason for the low knowledge. We did not assess the skills of the FLWs related to the smartphone or laptop/computer use. This study was conducted at a primary health care level and in a rural setting in India which cannot be generalized to other regions. Future health-related applications or digital programs can be developed based on the suggestions and needs of FLWs and be based on smartphones. Findings from this study can be used for planning an intervention or in providing an enabling environment for IT use among FLWs.

## Conclusion

We found that FLWs had knowledge regarding the benefits of IT use, but they lacked knowledge regarding laptop/computer use. They had a satisfactory level of confidence in using smartphones, and most of them were using mobile applications. The majority of the FLWs had a positive attitude and belief toward IT use. The findings from this study show promising results for the introduction of smartphones for IT at the primary health care level.

### Acknowledgements

We are thankful to all the Frontline workers for their participation and for their cooperation.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

## References

1. Stevenson A. Oxford Dictionary of English. USA: Oxford University Press; 2010.
2. Braun R, Catalani C, Wimbush J, Israelski D. Community health workers and mobile technology: A systematic review of the literature. PLoS One 2013;8:e65772.
3. Lewin S, Munabi-Babigumira S, Glenton C, Daniels K, Bosch-Capblanch X, van Wyk BE, *et al.* Lay health workers in primary and community health care for maternal and child health and the management of infectious diseases. Cochrane Database Syst Rev 2010;2010:CD004015.
4. Bigirwa P. Effectiveness of Community health workers (CHWS) in the provision of basic preventive and curative Maternal, newborn and child health (MNCH) interventions: A systematic review. Health Policy and Development 2009; 7 (3):162-72.
5. Ngabo F, Nguimfack J, Nwaigwe F, Mugeni C, Muhoza D, Wilson DR, *et al.* Designing and implementing an innovative SMS-based alert system (RapidSMS-MCH) to monitor pregnancy and reduce maternal and child deaths in Rwanda. Pan Afr Med J 2012;13:Article 31. Available from: <http://www.panafrican-med-journal.com/content/article/13/31/full/>
6. McNabb M, Chukwu E, Ojo O, Shekhar N, Gill CJ, Salami H, *et al.* Assessment of the quality of antenatal care services provided by health workers using a mobile phone decision support application in northern Nigeria: A pre/post-intervention study. PLoS One 2015;10:e0123940.
7. Gisore P, Shipala E, Otieno K, Rono B, Marete I, Tenge C, *et al.* Community based weighing of newborns and use of mobile phones by village elders in rural settings in Kenya: A decentralised approach to health care provision. BMC Pregnancy Childbirth 2012;12:15.
8. Agarwal S, Labrique A. Newborn health on the line: The potential mHealth applications. JAMA 2014;312:229-30.
9. Gopalakrishnan L, Buback L, Fernald L, Walker D, Diamond-Smith N. Using mHealth to improve health care delivery in India: A qualitative examination of the perspectives of community health workers and beneficiaries. PLoS One 2020;15:e0227451.
10. IntraHealth International, United States. Frontline Health Workers Coalition. Available from: <https://www.frontlinehealthworkers.org/>

- org/. [Last accessed on 2020 Jan 10]
11. Hartzler AL, Tuzzio L, Hsu C, Wagner EH. Roles and functions of community health workers in primary care. *Ann Fam Med* 2018;16:240-5.
  12. Ramachandran D, Canny J, Das PD, Cutrell E. Mobile-izing health workers in rural India. In: Proceedings of the SIGCHI conference on human factors in computing systems. Atlanta, Georgia, USA. 2010. p. 1889-98.
  13. Ramachandran D, Goswami V, Canny J. Research and reality: Using mobile messages to promote maternal health in rural India. In: Proceedings of the 4<sup>th</sup> ACM/IEEE international conference on information and communication technologies and development. London, U.K. 2010. p. 1-10.
  14. Modi D, Dholakia N, Gopalan R, Venkatraman S, Dave K, Shah S, *et al.* mHealth intervention "ImTeCHO" to improve delivery of maternal, neonatal, and child care services-A cluster-randomized trial in tribal areas of Gujarat, India. *PLoS Med* 2019;16:e1002939.
  15. Faujdar DS, Sahay S, Singh T, Jindal H, Kumar R. Public health information systems for primary health care in India: A situational analysis study. *J Family Med Prim Care* 2019;8:3640-6.
  16. Prinja S, Nimesh R, Gupta A, Bahuguna P, Gupta M, Thakur JS. Impact of m-health application used by community health volunteers on improving utilisation of maternal, new-born and child health care services in a rural area of Uttar Pradesh, India. *Trop Med Int Health* 2017;22:895-907.
  17. Ilozumba O, Van Belle S, Dieleman M, Liem L, Choudhury M, Broerse JE. The effect of a community health worker utilized mobile health application on maternal health knowledge and behavior: A Quasi-experimental study. *Front Public Health* 2018;6:133.
  18. Timmons S. Nurses resisting information technology. *Nurs Inq* 2003;10:257-69.
  19. Ghoochani M, Kahouei M, Hemmat M, Majdabadi HA, Valinejadi A. Health information technology and health care activists: Where is the place of Iranians? *Electron Physician* 2017;9:5657-62.
  20. Ilozumba O, Dieleman M, Kraamwinkel N, Van Belle S, Chaudoury M, Broerse JE. "I am not telling. The mobile is telling": Factors influencing the outcomes of a community health worker mHealth intervention in India. *PLoS One* 2018;13:e0194927.
  21. Sukums F, Mensah N, Mpembeni R, Kaltschmidt J, Haefeli WE, Blank A. Health workers' knowledge of and attitudes towards computer applications in rural African health facilities. *Glob Health Action* 2014;7:24534.
  22. Kipturgo MK, Kivuti-Bitok LW, Karani AK, Muiva MM. Attitudes of nursing staff towards computerisation: A case of two hospitals in Nairobi, Kenya. *BMC Med Inform Decis Mak* 2014;14:35.
  23. Peters DH, Kohli M, Mascarenhas M, Rao K. Can computers improve patient care by primary health care workers in India? *Int J Qual Health Care* 2006;18:437-45.
  24. Modi D, Saha S, Vaghela P, Dave K, Anand A, Desai S, *et al.* Costing and cost-effectiveness of a mobile health intervention (ImTeCHO) in improving infant mortality in tribal areas of Gujarat, India: Cluster randomized controlled trial. *JMIR Mhealth Uhealth* 2020;8:e17066.
  25. White A, Thomas DSK, Ezeanochie N, Bull S. Health worker mHealth utilization: A systematic review. *Comput Inform Nurs* 2016;34:206-13.
  26. Ministry of Electronics and IT, Government of India. Digital India Programme. 2015. Available from: <https://digitalindia.gov.in/content/about-programme>. [Last accessed on 2020 Jan 10].



**Annexure 1: Details of age and education of various FLW among the FLWs**

Variable	ASHAs (n=75)	AWWs (n=37)	MPWs (n=28)	IAs (n=2)	MOs (n=2)	Total (n=144)
Mean age (SD)	39.5 (6.9)	44.2 (8.2)	39.8 (8)	32 (1)	32.5 (2.1)	40.5 (7.7)
Mean years of education (SD)	10.8 (2.2)	11.6 (2.1)	13.4 (2)	14.5 (0.7)	20.5 (0)	11.7 (2.6)

**Annexure 2: Median (IQR) score for the attitude statements towards the use of information technology among the FLWs (n=144)**

Attitude Statements	ASHAs (n=75)	AWWs (n=37)	MPWs (n=28)	IAs (n=2)	MOs (n=2)	Total FLW (n=144)
I believe that the use of computer/mobile can assist me at my work	4 (4-5)	5 (4-5)	4 (4-5)	5 (5-5)	4.5 (4-5)	4 (4-5)
I am capable to use the computer/mobile during patient care	4 (3-4)	2 (2-5)	3.5 (2-5)	3.5 (3-4)	4.5 (4-5)	4 (2-4)
I think using computers/mobile will increase workload in duties in my health centre*	3 (1-4)	4 (3-5)	4 (2.5-4.5)	5 (5-5)	3.5 (3-4)	3 (2-4)
I believe computers/mobile can support my clinical decision making during the provision of healthcare	3 (2-4)	5 (3-5)	4 (3-4)	4 (3-5)	4 (4-4)	4 (2-4)
I will not be capable to learn and use computers/mobile systems*	4 (2-4)	4 (3-4)	4 (3.5-5)	5 (5-5)	4 (3-5)	4 (2-4)
I think the use of computers/mobile will certainly improve the quality of care	4 (4-5)	4 (4-5)	4 (4-5)	5 (5-5)	4 (4-4)	4 (4-5)
I believe that proper training can make the use of mobile/tablet easy	4 (4-5)	4 (4-5)	4 (4-4)	5 (5-5)	4.5 (4-5)	4 (4-5)
I believe that using a mobile/tablet for data collection/entry can save time	4 (3-5)	4 (4-5)	4 (3.5-4)	5 (5-5)	4.5 (4-5)	4 (4-5)
I believe that using the information will increase knowledge of workers and patients	4 (4-5)	5 (4-5)	4 (3-4)	3 (1-5)	4 (4-4)	4 (4-5)
Using Information technology provide updates on time to health workers	4 (3-4)	4 (3-5)	4 (4-4)	5 (5-5)	4 (4-4)	4 (3-4)
The use of information technology can help in tracing the patients who need more attention and care	4 (4-5)	4 (4-5)	4 (3-4)	5 (5-5)	4.5 (4-5)	4 (4-5)
I believe Information technology facilitates the timely delivery of health services	4 (3-5)	4 (3-5)	4 (3-4)	5 (5-5)	4 (4-4)	4 (3-5)
I believe health workers in my centre are willing to learn/use computers/mobile at their workplace	4 (4-5)	4 (4-5)	4 (3.5-4)	4.5 (4-5)	3.5 (3-4)	4 (4-5)
I believe traditional way of data collection (on paper) should be replaced with modern technology (by using mobile/tablet)	4 (4-5)	5 (4-5)	4 (3.5-4)	4.5 (4-5)	4.5 (4-5)	4 (4-5)
Total median score	53 (48-58)	54 (50-64)	54.5 (46.5-60)	64.5 (63-66)	58 (55-61)	54 (48-59)

\*Scorings were reversed for negative statements. <sup>§</sup>Attitude statement number 1, 2, 3, 4, 6 were categorised as 'attitude toward IT devices', attitude statement number 8,9,10,11,12 were categorised as 'attitude toward IT usage and acknowledging its importance', and attitude statement number 5, 7, 13,14 were categorized as 'attitude toward IT learning and future use'