Original Article

Smartphone usage in neonatal intensive care unit

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ABSTRACT

Introduction: Mobile Phone (MP) has become an integral part of life in this modern era. In clinical practice it is used for various several other reasons apart from communication. As, it is a potential source of infection, it use should be optimized. **Objectives:** This study was done to determine the Knowledge, Attitude, and Practices of MP usage and disinfection among the healthcare workers (HCW) in neonatal intensive care unit of a tertiary care hospital. **Materials and Methods:** This was a descriptive cross-sectional study. The study subjects were doctors and paramedical staff. They were interviewed using a structured pretested questionnaire in three domains, knowledge (12), attitude (11), and practice (17). The response was assessed against either for predefined answers and expressed as percentages. **Results:** A total number of 54 HCW were interviewed. Among knowledge domain, most of HCW (>80%) were aware of various aspects about role of MP in infection transmission; however, the response was lesser when it came to optimum technique of disinfection. In the domain of attitude, most of subjects agreed that the MP use should be reduced and it should be disinfected but there were concerns regarding damage with repeated infections. Routine disinfection of MP was being done in 75% of cases and almost half were doing it more frequently post Coronavirus pandemic. For practice aspect, alcohol swabs were most commonly used for disinfection and physical barrier was also being used in 45% of cases. **Conclusion:** The knowledge and attitude about role of MP in infection among HCW is good. However, there is scope for improving practices in terms of correct method of disinfection, reducing, balancing, and optimizing its use.

Key words: Knowledge, Attitude, Practices, Mobile phones, Disinfection

Mobile phone (MP) has become inseparable part of human life, both personal, and professional including health-care related ones. MP usage has increased from 10 to 60%in just 8-year period from 2011 to 2018, and is predicted to be around 80% by 2025 [1]. There are around 5.07 billion MPs users worldwide, of which India inhabits 23%, that is, almost 1.2 billion users which is only next to China [2,3].

In health-care setting, apart from communication, MPs can be very handy in exploring information at point of care, which ultimately provides best possible evidence based practices to patients, along with using different medical applications for day-to-day practice; although, they also act as a source of distraction and compromise aseptic environment [4]. With present ongoing pandemic there is lot of stress on teleconsultations leading to widespread usage of smartphones in intensive care unit (ICU).

MPs are frequently used and come in contact of face and hands, they heat up to a considerable temperature when used, thereby promoting for bacterial growth and its transmission. However, as there were no guidelines for its cleaning or disinfection and not being a common practice, as per a report almost 72% users have never cleaned their device. Thus MPs are often full of microbial contamination acting as fomites and are potential risk factor for disease transmission through fomites in public health globally [5].

MPs are touched on an average 3 h/day and are contaminated by plethora of organisms [6]. In an Indian study, almost 100% healthcare workers (HCW) used MPs in health-care setting but only 10% had ever cleaned them [7]. The overall impact of potential harm of MP contamination can only be ascertained on the basis of magnitude of the mobile usage for various practices, personal beliefs, and knowledge of HCW about cleaning and disinfection practices. Therefore, the study was aimed to assess the knowledge, attitude, and practices of MP usage and disinfection among health-care providers in a tertiary care hospital. This would help in identifying the sectors in which efforts should be done for the improvement.

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MATERIALS AND METHODS

This was a cross-sectional study in the level III Neonatal intensive care unit (NICU) in a tertiary care center. The department offers intensive care facilities, post-ICU care, and outpatient services. All the HCWs in ICU were asked to participate in the study to evaluate knowledge, attitude, and practice about MP usage and disinfection. The data were collected from the doctors, nursing staff, and other supporting staff. Informed verbal consent was taken from all the subjects before the study.

The HCW were interviewed using a structured pretested questionnaire in three domains, knowledge (1–12), attitude (13–23), and practice (24–40). The questionnaire focused on questions related to various aspect of MP usage in NICU. The questionnaire was pretested in five doctors and five nursing staff to check its appropriateness and was modified. Most of the questions were closed ended. The responses were tested against standard predefined answers and were expressed in percentages. Answers related to knowledge were evaluated as correct and incorrect. Demographic characteristics of the participants were noted. Other results were expressed as mean and percentages.

RESULTS

The questionnaire was handed over to 54 HCWs and all responded to questionnaire. Demographic characteristics of the subjects are mentioned in Table 1. The mean age of the respondent was 33±9 years. Out of the total 54 HCW, there were12 doctors, 21 nursing staff and 21 support staff. Overall there were 70.3% female HCW.

Knowledge Related to MP Disinfection

In the knowledge domain of MP practices, 96% knew that MP can transmit infection, while only 79% knew the route of transmission. Almost all (98%) correctly knew what solution should be used to disinfect the MP (70% alcohol) but the correct frequency of disinfection was known by only 8% of HCWs. Regarding disinfection, 21% of the participants believed that UV rays can also be used to disinfect MPs (Table 2).

Attitude Regarding MP Disinfection

About MP usage, almost all (96%) believed that MP is one of the frequently touched surfaces; hence, it is important to disinfect it. Although, 79% participants also believe that this practice of disinfecting MP might damage the phone. About MP usage inside NICU, only 53% participants supported banning its use inside NICU, although 94% believe that its usage can be reduced (Table 2).

Practice Regarding MP Disinfection

During this study, it was observed that 20% of the participants use MP while attending patients or near patient's bed. About

Table 1: Baseline characteristics and information about mobile phone use

Baseline characteristics	Total: 54 n (%)
Gender	
Male	16 (29.6)
Female	38 (70.3)
Mean age (±SD) in years	33±9
Education	
Medical graduate/Postgraduate	13 (24)
Nursing graduate/Diploma	21 (38.8)
Graduate	5 (9.2)
Intermediate/Matriculation	9 (16.6)
<10th	6 (11.2)
Rank	
Doctors	12 (22.22)
Nursing staff	21 (38.9)
Support staff	21 (38.9)
Unit*	
Neonatal intensive care unit	48
Ward	17
Outpatient department	11
Number of Mobile phones	
1	40 (74)
2	13 (24)
>2	1 (1.85)
Type of phones	
Smartphone	39 (72.2)
Keyboard	6 (11.1)
Both	9 (16.6)
Do you use mobile phones in hospital?	
Yes	54 (100)
No	0
Answer phone calls in NICU	
Never	7 (12.9)
Sometimes (<50% of all)	43 (79.6)
Always (50% of all)	4 (7.4)
Use phone in NICU for:*	
Taking calls	36
HIS	8
Photo of cases	8
Social media	3
Medical information	19
Others	4
Not answered	0–6
Approximate use in NICU h/day	
<4	51 (94.5)
4–8	3 (5.5)
>8	0
Frequency of cleaning mobile phones	
Once a shift	19 (35.2)
Frequently (>1/shift)	30 (55.5)
Rarely (>2 days)	5 (9.2)
Never	0
No of patients contacted/examined per day	
<10	34 (62.9)
10–20	16 (29.6)
>20	4 (7.4)
How long back you cleaned your phone?	
<1 day	48 (88.9)
>1 day	6 (11.1)

*not exclusive category

Table 2: Knowledge, attitude, and practice of healthcare workers regarding mobile phone use in hospital

Q.	Knowledge	Response (%)
1.	What is hospital acquired infection?	
	Correct	22 (40.7)
	Incorrect	32 (59.2)
2.	Do you know that mobile phone (MP) can transmit infections?	
	Yes	52 (96.3)
	Not sure	2 (3.7)
3.	Do you know how does it transmit infection?	
	Yes	43 (79.6)
	No	8 (14.8)
	Not sure	3 (5.6)
4.	Do you know what micro-organisms it can spread?	
	Bacteria	4 (7.4)
	Virus	1 (1.7)
	All (Bacteria, Virus, and Fungus)	49 (90.7)
5.	Do you know what solution is used to disinfect MP?	
	Yes	53 (98.1)
	No	1 (1.9)
6.	IF YES to answer Q5 then, what solutions should be used to disinfect MP?	
	Correct	53 (100)
7.	Do you know what should be the frequency of MP disinfection?	
	Yes	34 (62.9)
	No	20 (37)
8.	If yes to answer seven then, what should be frequency of disinfection?	
	Correct	8 (14.8)
	Incorrect	26 (48.1)
9.	Do you know when to disinfect your MP?	
	Yes	39 (72.2)
	No	3 (5.6)
	Not sure	12 (22.3)
10.	Do you know most common route of spread by MP?	
	Yes	41 (75.9)
	No	8 (14.8)
	Not sure	5 (9.2)
11.	IF Answer to Q10 is yes then, what is it?	
	Correct	39 (72.3)
	Incorrect	15 (27.7)
12	Do you know UV rays can disinfect MP?	
	Yes	21 (38.9)
	No	13 (24)
	Not sure	20 (37)
Attitude		
13.	Do you agree that health-care personals can spread infection?	
	Yes	51 (94.4)
	No	3 (5.6)
14.	Do you agree that MP comes under frequently touched surfaces?	
	Yes	51 (94.4)
	No	3 (5.6)
15.	Do you agree that mobile phone can act as fomite/contaminant?	
	Yes	54 (100)
16.	Do you agree that mobile phone can be disinfected?	
	Yes	53 (98.1)
	No	1 (1.9)
17.	Do you agree that mobile phone disinfection is important?	
	Yes	53 (98.1)
	No	1 (1.9)
18.	Do you agree that MP disinfection can reduce infection?	
	Yes	52 (96.3)
	No	2 (3.7)
19	Do you agree that MP disinfection can damage your phone?	
	Yes	43 (79.6)
	No	11 (20.3)
20.	Do you agree that mobile phone should be banned inside NICU?	
	Yes	29 (53.7)
	No	25 (46.3)
21.	Do you agree that mobile phone is completely avoidable inside NICU?	
	Yes	35 (64.8)
	No	19 (35.2)
22.	Do you agree that MP usage can be reduced in NICU?	
	Yes	51 (94.4)
	No	3 (5.6)
23.	Do you agree that MP usage in NICU cause more harm (infection, disturbance in patient care) than good?	
	Yes	48 (88.9)
	No	2 (3.7)
	Not sure	4 (7.4)
Practices		
24	Do you use it near patient's bed?	
	Yes	11 (20.3)
	No	43 (79.6)
25	Do you use it while attending patients?	
	Yes	8 (14.8)
	No	46 (85.2)
26	Do you use MP with gloved hands?	
	Yes	11 (20.3)
	No	43 (79.6)
27	Do you ever disinfect your mobile phone?	
	Yes	53 (98.1)
	No	1 (1.9)
28	Did you used to disinfect it before COVID-19 pandemic?	
	Yes	40 (74)
	No	7 (12.9)
	Sometimes	7 (12.9)

(Contd...)

Table 2:*(Continued)*

Q.	Knowledge	Response (%)
29	Do you disinfect your phone more frequently after COVID-19 pandemic?	
	Yes	27 (50)
	No	14 (25.9)
	Sometimes	13 (24)
30	Do you use alcohol for disinfection?	
	Yes	52 (96.3)
	No	2 (3.7)
31	Do you use other methods for disinfection?	
	Yes	37 (68.5)
	No	17 (31.5)
32	If says yes then what they use other than alcohol, (specify dry swab/lens cleaning solution, and medicated wipes/plain wipes)	
	Medicated wipes	34 (91.2)
	Dry Cotton	3 (8.1)
33	Do you follow hand hygiene (hand wash/ hand rub) practice before using MP?	
	Yes	38 (70.3)
	No	16 (29.6)
34	Do you follow hand hygiene (hand wash/ hand rub) practice after using MP?	
	Yes	49 (90.7)
	No	5 (9.2)
35	Do you share your MP with your colleagues?	
	Yes	16 (42.1)
	No	38 (57.9)
36	If Answer to Q35 is yes then Do you disinfect after taking back?	
	Yes	16 (100)
37	Do you use physical barrier for MP?	
	Yes	25 (46.3)
	No	29 (53.7)
38	Do you find difficulty in using MP after physical barrier?	
	Yes	20 (80)
	No	5 (20)
39	Did you try to get information about mobile phone disinfection after COVID-19 pandemic?	
	Yes	29 (53.7)
	No	25 (46.3)
40	Please rate your practice of disinfection on a scale of 1 to 5 before and after COVID-19 pandemic? #	
	Before	37.6
	After	68.3

#Values expressed in summation score, MP: Mobile Phone

20% of them use it with gloved hands. Among all, only 2% of them have never disinfected their phone, while 13% of them were not doing it before COVID pandemic. About 50% agreed that after COVID pandemic, they are disinfecting their phones more frequently. While 96% of all use alcohol for disinfection, among 68% participants who use other methods also, medicated wipes are the most common one used by 91% participants. About 46% of them agreed to use some sort of physical barrier on MP to prevent infection. About 46% of all participants never tried to get any information on MP disinfection after COVID pandemic (Table 2).

DISCUSSION

Sepsis is a major cause of mortality and morbidity in neonates and infants. Along with other frequently touched surfaces, MPs also act as a route of transmission for nosocomial infections [8,9]. Hand hygiene reduces the individual risk of transmission, along with community transmission [10,11]. Successful implementation of MP disinfection practices requires motivation, supervision, and behavioral change from the health-care professionals.

In a study conducted by Simmonds *et al*. in 2018, 91.6% of hospital staff admitted to using their device while at work. Less than 10% of hospital staff cleaned their device daily, 28.4% weekly and 62.0% had never cleaned their device [12]. In our study, all subjects were using MP but number of subjects disinfecting their MPs was higher (72%). It could be due to present pandemic condition. The role of the environment in the transmission of HAIs is increasingly being recognized, and the ubiquity of mobile devices in that environment warrants consideration of their role in infection transmission [13]. They also found that phones cleaned on a daily basis were significantly less contaminated.

A high prevalence of MP contamination was found in the cross sectional study by Heyba *et al.*, about microbiological contamination of MPs of clinicians in ICUs and public hospitals. Of 203 clinicians, 15 (7.4%) use more than one MP while in our study, approximately 26% of the participants were carrying more than one MP [14]. With increasing usage of smartphones and need of alternative contact provision in some hospitals may be the reason of usage of more than 2 devices. Approximately one-fifth reported that they always answer their MP calls while in ICU.

More than half of the participants reported using their MPs to search for medical information and/or take photos of the cases. In our study, two-third of the HCW (66%) used it for taking calls while around 15% used it for taking images or searching medical information. In the above study, only 68/203 (33.5%) clinicians have ever disinfected their MPs. Of those clinicians, about half (32 clinicians) reported disinfecting their MPs daily or weekly, while 28 (41.1%) clinicians disinfect their MPs only when they get dirty. Out those clinicians who used to disinfect their MPs, 50 (73.5%) reported using alcohol wipes and only 9 (13.2%) used liquid personal hand disinfectant. In our study, around 96% participants used alcohol for disinfection.

In terms of self-reported MP hygiene practices; in our study, 66.5% of the participants have never disinfected their MPs. This was similar to that reported from Saudi Arabia, where 76.0% of clinicians have never disinfected their MPs [15]; and in a surgical setting in Northern Ireland, where only 37% of HCW admitted cleaning their MP regularly [16]. Studies have demonstrated that the microbiological profile of the clinicians' MPs correlates with the pathogens isolated from the clinicians' hands, which may indicate that MP contamination might be a predictor for hand contamination [17,18].

Approximately 63.0% of clinicians thought that MPs can play a role in spreading infections in healthcare settings. However, 68.0–78% of clinicians opposed banning the use of MPs in their units [19]. In our study also, although 96% participants believed that MP play a role in spreading infection only 47% supported a complete ban of phones inside NICU, 95% believed that its use in ICUs can definitely be decreased by some self-commitment and standard policies. While losing the momentum to ban MPs in ICUs and other clinical settings, it is sensible to increase the awareness about MPs disinfection rather than trying to forcefully ban using MPs in clinical settings.

In the study by Bodena *et al*. about bacterial contamination of MPs of HCW about 80.5% of participants had a touchscreen type of MP. In our study also 835 of participants had touchscreen type MP. Although the majority (80%) of the study participants believed that cell phones could carry bacteria, yet 97.3% of them use their MPs in the hospital setup. About 75% participants shared their MPs with colleagues. About two-third subjects used to wash hands after using MP [20]. In our study, out of 54 participants, 72% carry a smartphone with touch screen, and 79% used to take calls inside NICU less than half of times. Forty-two percent participants shared their MP with coworkers. About hand hygiene practice, 90% follow hand hygiene, that is, either hand wash or hand rub after using their MP, while only 70% follow it before using.

In a questionnaire based study by Banawas *et al*., on 285 HCW in three hospitals, the information was collected on cell phone usage at the work area and in the toilet, cell phone cleaning and sharing, and awareness of cell phones being a source of infection. They found that 77.9% participants used their cell phones at work, 56.1% shared their phone with colleagues, and 44.9% never cleaned their phones. In addition, 23.8% of participants believed that cell phones could serve as a source of bacterial transmission, and over half of the participants (61.5%) reported that they agreed with restriction rules for using cell phones in the college. There was, however, a positive correlation between the contamination level and the usage of cell phones at the work area and cleaning cell phones by disinfectants [21]. Bhoonderowa *et al*. reported that sharing MP within females was associated with high bacterial load [22]. It was recommended by the previous studies that the level of bacterial contamination on the cell phones of HCW can be reduced by reduce sharing [23].

A review done by Olsen *et al*. in 2020 of 56 studies from 2005 to 2019 named "MPs represent a pathway for microbial transmission: A scoping review" has provided a comprehensive, worldwide analysis of publications that explored the presence of microorganisms on MPs. The average contamination rate of MPs, as calculated there, was 68% which is likely to be an under-representation of the real values, as most studies reviewed there aimed to identify only bacteria, and because the identification methodologies used relied on growth of the organisms in media and their subsequent identification [24].

The results from this review indicate, nonetheless, that MPs from 24 different countries around the world harbor a diverse range of microorganisms, including several with antibiotic resistance. While sporadic health-care standards for infection prevention and control in the use of MPs exist [25]; to the best of our knowledge, the great majority of hospitals and clinics across the world have non-existent or limited guidelines in place as well as limited training in decontaminating MPs. It is also important to note that patients coming in and out the health-care settings also utilize their MPs and no guidelines are in place to address or prevent such impacts in hospitals infections. Hospital acquired microbes on patient's MP could ultimately provide a pathway for infection spread to the wider community.

Due to current pandemic of COVID-19, the CDC has just recently published information regarding cleaning and disinfecting high touch surfaces (including MPs) at home when someone is sick. While the CDC advises at home sick individuals to follow manufacturer's instructions, they also advise, in case of no guidance, to use alcohol-based wipes containing at least 70% alcohol [26].

The cross-sectional nature of the study was a limitation and an interventional study after applying the policy and training the staff would be a better design to evaluate knowledge, attitude, and practice and generalize the findings. Small sample size was another limitation. It would also have been better to look for difference in knowledge, attitude, and practices in respect to age, experience, and place of posting of study subjects. However, the study sample size was small, due to which it was not feasible to get meaningful observations for the same. A change in behavior study should have been done after strict implementation of MP disinfection policy and change in practice could have been observed and followed.

CONCLUSIONS

Knowledge related to MP usage and decontamination was adequate among HCW at all positions from doctors, nurses, and other supporting staff. It is important to make efforts towards making change in practice. Although health-care professional believe that MP is a contaminant, but do not agree for its complete ban in the NICU. Hence, it is very important to practice and strictly adhere to disinfection and hand hygiene policies and to increase their knowledge and bring a change in attitude and practices.

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