



## Impact of Smartphone Usage on Healthcare Professionals in Saudi Arabia: A Cross-Sectional Multicenter Study

Tahani N. Altamimi<sup>1,2\*</sup>, Mohammed M. Khan<sup>3</sup>, Johnson J. Alex<sup>3</sup>

<sup>1</sup>Department of Family and Community Medicine, College of Medicine, University of Hail, Hail, Saudi Arabia

<sup>2</sup>Department of Family and Community Medicine, College of Medicine, Dar Al Uloom University, Riyadh, Saudi Arabia

<sup>3</sup>Department of Basic Medical Sciences, College of Medicine, Dar Al Uloom University, Riyadh, Saudi Arabia

\*Corresponding e-mail: [tahanin.altamimi@gmail.com](mailto:tahanin.altamimi@gmail.com)

### ABSTRACT

**Objective:** There are growing concerns regarding the negative impacts of smartphone use on healthcare providers' personal and professional lives. We aimed to assess the extent of smartphone usage among healthcare workers in Saudi Arabia and measure its impact on their personal and professional lives. **Methods:** A cross-sectional online study, using the Smartphone Impact Scale (SIS) was conducted among healthcare workers from the private and government sector. **Results:** The participants (N=1511; 36.5% Saudi, 63.5% non-Saudi) included physicians and allied healthcare providers. A significant difference in smartphone usage between physicians and allied health providers was found; the main purpose for using smartphones during working hours was for personal and patient care (69%). The association between the impact of smartphone usage and socio-demographic variables was significant, and the SIS's domains were significantly correlated. The impact of smartphone usage on personal and professional life was mildly negative and negligible, respectively. **Conclusions:** Smartphone usage decreased with age, and the impact thereof was associated with time spent using it. Results also pointed to a robust relationship between the different domains of SIS. Overall, smartphone usage had a significant influence on healthcare providers and impacted their personal and professional lives.

**Keywords:** Smartphone, Smartphone addiction, Impact, Healthcare professionals, Saudi Arabia

### INTRODUCTION

The number of smartphone users among healthcare professionals has increased exponentially. The most modern smartphones represent handheld computers, rather than phones, due to their prevailing on-board computing ability, large memories, big screens, and open operating systems [1]. Given the increase in smartphone use, the number of users worldwide was projected to surpass the 2.5 billion mark in 2019 [2]. In developed countries, the use of smartphones in hospitals is widespread. Nearly all healthcare professionals own smartphones [3]. The usages thereof, and its impact, among doctors in various specialties, relating to their communication and consultation with colleagues, supervisors, and sometimes patients, have been examined in many studies [3,4]. Doctors have also been known for using their smartphones to access point-of-care information, education (e-books and journals), research, and telemedicine, and monitor situations at the clinic and patient's bedside [4]. In general, physicians' usage of smartphones for professional purposes has been steadily increasing from 68% in 2012 to 84% in 2015 [3]. Simultaneously it has become an essential part of their personal life, from connecting to family and friends to socializing and getting entertained.

Problematic or excessive mobile phone use refers to people's inability to control their mobile phone usage, leading to adverse consequences in their personal lives (including financial problems, sleep disturbances, attention and learning

impairments in educational settings, excessive sedentary behavior, and deterioration of personal relationships) and professional settings [2]. In healthcare work settings, pervasive smartphone use may present many challenges, including privacy and security risks, and employee distraction [5]. In Saudi Arabia, around 56.20% of healthcare professionals (including nurses, physicians, and other healthcare providers) use their smartphones during working hours [6]. Also, around 43.80% of healthcare providers agreed that smartphone use distracted them from patient care, and around 42.20% believed that these distractions harmed patients [6].

There is a growing concern regarding the impact of excessive smartphone use on the physical and mental health of healthcare professionals, significantly affecting their professional lives, and causing distraction in decision-based activities (especially patient care) [2-6]. This indicates the need for guidelines regulating smartphone usage in healthcare settings. No studies have examined the impact of smartphone usage among healthcare professionals using a multi-dimensional (personal, physical, and professional lives) approach. This study, using a cross-sectional approach, investigated the extent of smartphone usage among healthcare professionals in Saudi Arabia, and its impact on their personal and professional lives.

## METHODS

### Selection and Description of Participants

We used a convenient sampling method, including healthcare professionals from different healthcare institutions under the Ministries of Health (MOH), and Ministries of Education (MOE), and the private health care sector in Saudi Arabia, as participants. Their details were obtained from the Saudi Commission for Health Specialties' (SCFHS) data bank. The Survey Monkey link was sent to them online as a personal invitation, containing detailed information about the study. Having read the information, they consented to participation electronically by clicking on "agreeing to participate". The responses were collected via an online survey from January to April 2020.

The participant selection criteria included: male and female healthcare professionals who have used a smartphone for personal/professional purposes for at least 6 months, been a healthcare provider with at least 6 months of professional experience in the healthcare industry in Saudi Arabia; is registered under the SCFHS. The participants were selected from 2 categories of medical professionals: Physicians and dentists, and allied health professionals (including pharmacists, nurses, physiotherapists, respiratory therapists, dental hygiene technicians, dental assistants, public health educators, medical technicians, laboratory technicians, blood bank technicians, optometrists, lifestyle educators, clinical nutritionists, healthcare management specialists, health informatics specialists, cardiology/cath lab technicians, trauma care technicians, medical record managers, biomedical engineers, speech and audiology specialists, and occupational therapists). This study was approved by the Institutional Review Board and Ethical Committee and was conducted following the Code of Ethics of the World Medical Association (Declaration of Helsinki). Participation was voluntary and confidentiality was assured.

### Technical Information

Socio-demographic data (nationality, gender, age, specialty, and current city of work, work set up, career designation-senior vs. junior, average hours of smartphone usage during work and the whole day, and the main purpose of smartphone usage) was collected using a questionnaire.

We used the Smartphone Impact Scale (SIS) to measure the impact of smartphone use on the participants. It shows good reliability and validity, a test-retest reliability score of 0.85 (95% CI-0.74, 0.92), and internal consistency (Cronbach's alpha value) of 0.91 [7]. The construct validity of the scale was established using exploratory and confirmatory factor analysis. Each item was rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). This 23-item scale contained three domains: extent of smartphone use (13 items, maximum score: 65), the impact of smartphone use on personal (5 items, maximum score: 25), and professional life (5 items, maximum score: 25).

For the "extent-of-smartphone-use" domain (minimum score: 13, maximum: 65), a total score equal to or smaller than 38 indicated normal use of the smartphone, seen as "positive". Scores from 39 to 45, 46 to 50, and 51 and higher, indicated a mild negative ("needs attention"), moderate negative ("needs action"), and severe ("needs professional help") impact of smartphone usage. For the domain 'impact-of-smartphone-use on personal life' (minimum score 5, maximum 25), total scores of 14 or less, 15 to 17, and 18 to 20 indicated a normal, moderate negative ("needs action"),

and severe (“needs professional help”) impact of smartphone usage, respectively. Lastly, for the domain ‘impact of smartphone use on professional life’ (minimum score 5, maximum 25), total scores of 14 or less, 15 to 16, and 17 to 18 indicated a strong positive, mild negative, and moderately negative (“needs action”) impact of smartphone usage, respectively. Scores of 19 and above indicated a severe impact (“needs professional help”).

The combined scores of the three domains presented a total SIS score, ranging from 23 to 115. Higher scores indicated higher smartphone usage and a negative impact on healthcare providers. In particular, a total SIS score below or equal to 66, between 67 and 74, and 75 and 84, indicated the smartphone use had a normal, mild (“needs attention”), and moderate (“needs action”) impact on the participant, respectively. Scores of 85 and above showed the smartphone use had a severe, more negative effect (“needs professional help”) [7].

### Statistics

Data analysis was done using IBM Statistical Package for the Social Sciences (SPSS) Version 24.0 software, and descriptive statistics used to describe participants’ socio-demographic characteristics, including mean and total scores of the different SIS dimensions. We applied the Chi-square test to evaluate the association between socio-demographic and other selected variables. An independent t-test was performed to analyze the mean difference in smartphone use between physicians and allied healthcare professionals. Lastly, Pearson’s correlation coefficient was calculated to evaluate the correlation among the different domains of SIS.

## RESULTS

Of the 1,530 healthcare professionals who consented to participate, 19 returned incomplete response sheets, leaving us with 1,511 participants: 895 (59.2%) male and 616 (40.8%) female. Their mean age was  $40.69 \pm 9.11$  years; however, the majority (72.6%) were between 25 and 45 years, while only 7 (0.5%) were above 66. Table 1 shows the socio-demographic details of the participants. Most of them were non-Saudi healthcare providers. About 66.5% were physicians, 33.8% were allied health professionals, and almost half (46.5%) represented the central region of Saudi Arabia.

**Table 1 Socio-demographic details of the participants (N=1511)**

Socio-Demographic	N (%)
<b>Gender</b>	
Male	895 (59.2)
Female	616 (40.8)
<b>Age Category (years)</b>	
25-35	493 (32.6)
36-45	605 (40.0)
46-55	299 (19.8)
56-65	107 (7.1)
≥ 66	7 (0.5)
<b>Nationality</b>	
Saudi	551 (36.5)
Non-Saudi	960 (63.5)
<b>Province</b>	
Central	703 (46.5)
West	392 (25.9)
Eastern	189 (12.5)
South	122 (8.1)
North	105 (6.9)
<b>Category of Healthcare Providers</b>	
Physicians	1005 (66.5)
Allied Health	510 (33.8)

Results showed there was a significant difference in total smartphone usage score between physicians ( $64.92 \pm 13.78$ ) and allied healthcare providers ( $68.78 \pm 14.32$ ;  $t = -5.07$ ,  $p\text{-value}=0.000$ ,  $p<0.001$ ). Allied healthcare professionals’

mean total smartphone usage score was higher, compared to physicians. However, the mean difference in total smartphone impact score based on the designation (senior and junior) was not significant.

During working hours, the smartphones were mainly used for personal and patient care (N=1,043; 69.0%), much less (N=247; 16.3%) for patient care exclusively, and least (N=216; 14.3%) for personal matters only. The average score of smartphone usage among participants was  $66.22 \pm 14.08$ .

Regarding the domains, participants' smartphone usage impact on the domain of extent of smartphone use and use on personal life was  $38.5 \pm 9.26$  and  $14.15 \pm 4.04$ , respectively, which indicated negative mild impact ("needs attention").

On the other hand, the impact on the domain on smartphone use on professional life was  $13.56 \pm 3.07$ , which indicated normal and no impact on their professional life. Table 2 shows the impact of smartphone use on the different domains. Among the participants, 51.8% reported normal use of smartphones, while 48.2% experienced a mild to severe impact. Besides, 49.9% of participants reported mild to severe addiction to smartphone use, while its impact was reflected in their personal and professional lives as 53.7% and 36.7%, respectively.

**Table 2 Impact of smartphone use on different domains of healthcare providers (N=1511)**

Impact of Smartphone use	The extent of Smartphone use N (%)	Impact of Smartphone use on Personal Life N (%)	Impact of Smartphone use on Professional Life N (%)	Total Score N (%)
Normal ( $\leq 66$ )	758 (50.2)	835 (55.3)	956 (63.3)	782 (51.8)
Mild (67-74)	432 (28.6)	351 (23.2)	293 (19.4)	341 (22.6)
Moderate (75-84)	175 (11.6)	237 (15.7)	185 (12.2)	245 (16.2)
Severe ( $\geq 85$ )	146 (9.7)	88 (14.8)	77 (5.1)	143 (9.5)

Table 3 shows the analysis of the association between the impact of smartphone use and selected socio-demographic variables. There was no significant association between gender and province. However, age was significantly associated with the impact of smartphone use ( $\chi^2$  (df)=40.03 (12),  $p < 0.001$ ). This means that smartphone usage steadily decreased with age and that the younger age group was more engaged in smartphone use; thus, experiencing the related negative consequences. Also, age was significantly associated with the number of hours using a smartphone ( $\chi^2$  (df)=74.69 (16),  $p < 0.001$ ). Nationality significantly associated with the impact ( $\chi^2$  (df)=43.41 (3),  $p < 0.001$ ) and severity of smartphone use. Most study participants were non-Saudi (63.5%), and the impact of smartphone use among non-Saudi (48.2%) participants were more significant compared to Saudi (21.2%) participants.

**Table 3 Association between the impact of smartphone use and selected socio-demographic variables (N=1511)**

Variables		Category of SIS				N	$\chi^2$ (df)	p-value
		Normal	Mild Impact	Moderate Impact	Severe Impact			
Age	25-35 N (%)	216 (14.3)	125 (8.3)	104 (6.9)	48 (3.2)	493 (32.6)	40.03 (12)	0
	36-45 N (%)	319 (21.1)	126 (8.3)	93 (6.2)	67 (4.4)	605 (40.0)		
	46-55 N (%)	174 (11.5)	72 (4.8)	33 (2.2)	20 (1.3)	299 (19.8)		
	56-65 N (%)	70 (4.6)	17 (1.1)	12 (0.8)	8 (0.5)	107 (7.1)		
	$\geq 66$ N (%)	3 (0.2)	1 (0.1)	3 (0.2)	-	7 (0.5)		
Nationality	Saudi N (%)	230 (15.2)	134 (8.9)	111 (7.3)	76 (5.0)	551 (36.5)	43.41 (3)	0
	Non-Saudi N (%)	552 (36.5)	207 (13.7)	134 (8.9)	67 (4.4)	960 (63.5)		
Health Specialty	Physicians	574 (38.0)	199 (13.2)	153 (10.1)	79 (5.2)	1005 (66.5)	36.81 (3)	0
	Allied Health	208 (13.8)	142 (9.4)	92 (6.1)	64 (4.2)	506 (33.5)		
Smartphone use during working	<1 hour N (%)	407 (27.0)	119 (7.9)	71 (4.7)	38 (2.5)	635 (42.1)	185.45 (12)	0
	1-2 hours N (%)	251 (16.6)	122 (8.1)	82 (5.4)	21 (1.4)	476 (31.5)		
	3-4 hours N (%)	78 (5.2)	59 (3.9)	49 (3.2)	33 (2.2)	219 (14.5)		
	5-6 hours N (%)	21 (1.4)	29 (1.9)	23 (1.5)	26 (1.7)	99 (6.5)		
	>7 hours N (%)	25 (1.7)	12 (0.8)	19(1.3)	26 (1.7)	82 (5.4)		

Interestingly, the specialty of healthcare providers was significantly associated with the impact of smartphone use ( $\chi^2$  (df)=36.81 (3),  $p<0.001$ ). Physicians were more affected than allied healthcare providers, based on the severity of the impact of smartphone usage. Furthermore, the amount of time spent using smartphones during working hours was significantly associated with the impact of smartphone use ( $\chi^2$  (df)=185.45 (12),  $p<0.001$ ). This means that increased hours of smartphone usage corresponded to an increased impact. Among all participants, 73.6% used their smartphones for 1 to 2 hours during working hours, whereas 26.4% used them for more than 3 hours.

Furthermore, the analysis showed the correlation between the domains of SIS and its total score. SIS domains had a highly significant correlation with each other. The total score and extent of smartphone use showed high correlation ( $r=0.929$ ,  $p\text{-value}=0.000$ ,  $p<0.01$ ). Similarly, the extent of smartphone use was significantly correlated with personal ( $r=0.589$ ,  $p\text{-value}=0.000$ ,  $p<0.01$ ) and professional ( $r=0.464$ ,  $p\text{-value}=0.000$ ,  $p<0.01$ ) lives of the participants. The correlation between personal and professional impact was also significant ( $r=0.644$ ,  $p\text{-value}=0.000$ ,  $p<0.01$ ). The significance and strength of the correlation among the different domains of SIS reflected the validity of the total score. Overall, the current study's results provide an outline of the impact of smartphone use and its pattern on healthcare providers.

## DISCUSSION

The arrival of smartphones has transformed the healthcare sector significantly, presenting a boon and an occupational hazard. There are growing concerns regarding its negative impact on healthcare providers' personal and professional lives. Therefore, our study assessed the extent of smartphone use among healthcare workers in Saudi Arabia, and its impact on their personal and professional lives. Results showed that there has been a significant increase in smartphone usage among healthcare professionals. In particular, allied healthcare professionals used their smartphones more often than physicians. A UK study on smartphone usage among surgical doctors reported that 86.2% of the doctors used their devices to access medical resources online and a Saudi Arabian study among healthcare workers showed a smartphone utilization rate of 42.3%, mainly for drug information (69.8%), disease diagnosis (56.4%), or access to medical websites (42.5%) [8,9]. However, a similar study reported that 56.20% of respondents used their smartphones during working hours for sending/receiving e-mails, chatting, or watching video clips [6].

Considering the above, in this study, we categorized the purpose of smartphone usage into personal and professional use during working hours and found the majority of participants (69%) used their smartphones for both personal and patient care. This increase in usage may be attributed to large screen size (allowing mobile communication and computation simultaneously) and easy access to the Internet, social media, and various useful healthcare applications.

Our study also showed that the younger age group was more engaged in smartphone use, and that smartphone usage steadily decreased with age. This is similar to a study that reported junior doctors were more likely to use medical apps and access the Internet on their smartphone for medical information, than their senior colleagues [9]. Similarly, in a Nigerian study about smartphone use among doctors, younger doctors (less than 40 years old), particularly interns and doctors within 10 years of graduation, were using their smartphones significantly more in professional work [4].

We infer that there is a significant increase in smartphone usage at all levels and cadres of the health profession. This is evidenced by the fact that some participants were unable to control the desire to use their smartphones continuously, and were considering limiting the use of their smartphones to prevent its hazardous impact on their personal and professional lives. The increase in smartphone usage is found to be irrespective of gender, designation, and geographical distribution in Saudi Arabia, indicating that the use of smartphones for patient care at all levels affects patient care significantly, and plays a pivotal role in healthcare across Saudi Arabia.

Furthermore, we explored the impact (physical, emotional, and social) of smartphone use on the personal lives of healthcare professionals. Overall, 48.2% of participants reported mild to severe smartphone addiction and the impact significantly increased with extended smartphone usage. In a study regarding the use of devices among healthcare providers in emergency departments, over 40% of the respondents were significantly addicted to using their devices, and more than one-third felt the need to cut down their use [10]. Other research reported a 36.5% overall smartphone addiction prevalence rate among medical students in Saudi Arabia, and a significant association between the smartphone-addiction-scale total score and the daily usage hours [11]. In this study, 47.26% of participants who used their smartphones for 1-2 hours daily reported a mild to severe impact, which increased to 85.71% when the duration was

increased to 5-6 hours per day. Thus, the severity of the impact on the personal and professional lives of healthcare professionals, increased with extended smartphone usage, possibly attributed to long-standing physical and emotional stress. These findings are compatible with another study where 20.7% of participants reported ear problems, 50.7% lacked concentration; 47.3% blamed increased mobile device usage for hampering family life, and 42.3% thought it reduced quality family time [12]. In this study, the majority of users (57.5%) experienced physical discomfort after prolonged use, and 37.7% suffered from headaches. Moreover, a meta-analysis study indicated a small-to-medium association between smartphone use and stress and anxiety [13].

In our study, a significant number of participants felt discomfort in their fingers and wrists and experienced pain in their necks and backs, while a few reported sleep disturbances. Also, some of them struggled to concentrate on their work and personal lives and reported memory issues. Overall, 44.7% of the healthcare workers were mild to severely, and 14.8% severely, affected in their personal lives. This is compatible with a recent study reporting that the participants seemed to depend on the use of smartphones extensively, and the usage strongly related to sleep habits [14].

Overall, our findings suggest that smartphones have become an integral part of healthcare providers' personal lives. Considering smartphone reliance and addiction's negative impact (physical, social, or psychological) on human development and health, its exact influence is still being studied. If not seen, the negative effects may hinder the personal and professional lives of healthcare providers, and ultimately, patient care.

Undoubtedly, the integration of smartphones into healthcare has stimulated the utilization of information and technology in medical practices. Various studies confirm the improved quality of healthcare. For example, one study found that 94% of participants who used their smartphones for clinical work were more efficient, while 86% agreed that their smartphones enabled them to provide better patient care [15,16]. However, the use of smartphones in healthcare has also exposed healthcare professionals to various challenges, including patients' health information security, medical errors in patient care, and contamination risks. We explored the undesirable effects on patient care in our study. Similar to another study reporting the risks (privacy breaches, insecure data storage, and physician or institution liability for failure to obtain patient consent) associated with smartphone usage, we found a significant percentage of participants believed that sharing patients' medical information via this medium, may increase privacy breaches and cause unsafe medical data storage [5]. The unmonitored and unregulated use of smartphones for sharing patient information through social media platforms to facilitate patient care may cause unintentional breaches of privacy.

Furthermore, our study found that, due to excessive smartphone use, a few participants were unable to complete their planned daily work. Moreover, some thought that smartphones can be a distraction, potentially causing medical errors in clinical care, and others have even faced conflict with colleagues at work due to smartphone use. Among the studies supporting these findings, one reported that smartphones were a distraction to doctors working in hospitals [5]. A similar Saudi Arabian study among healthcare providers found that 43.80% of respondents agreed that smartphone usage distracted them from patient care, and 42.20% believed that these distractions were harmful to patients [6]. Moreover, in a South Korean study surveying nursing students, the students stated they were sometimes distracted by their smartphones, also witnessing other staff nurses being distracted by theirs [17]. These findings may well be ascribed to the increasing use of smartphones among healthcare workers at the workplace for personal and professional use, which carries the unavoidable risk of distraction and medical error that may lead to deleterious effects on patient health.

Research has also indicated that the use of smartphones, promotes the harboring of pathogenic microbes from the outside to the inside of the sterile areas in hospitals. The healthcare workers' phones act as transmissible vehicles for microbes, which has been particularly dangerous during the recent global outbreak of the novel coronavirus-2019 [18,19]. The healthcare professionals in our study were also concerned about their smartphone use at work due to the increased microbial contamination risk.

This study found that the overall impact of smartphone use on healthcare professionals' professional lives was 36.7%. The impact was mild in 52.79% of participants and moderate to severe in the remaining participants. This was attributed to their inability to complete their daily work and the risk of medical error in clinical care, associated with excessive smartphone usage, carrying the serious risk of being distracted from patient care. These findings highlight the undesirable consequences of excessive smartphone use on professional capacity, prompting policymakers to find efficient ways of dealing with this problem through strict regulations and monitoring practices in healthcare facilities.

### Limitations and Recommendations for Future Research

This study had some limitations. The majority of the sample was male. Furthermore, adding a patient's perspective, when measuring the impact of smartphone use on the professional lives of healthcare workers, may enhance the results. Further interventional research should focus on remedies to limit the undesirable impact of smartphone use on the personal and professional lives of these professionals. Moreover, future studies need to focus on objectively recording smartphone usage data. More research is also needed to fully understand the influence of evolving smartphone technology on the global healthcare system.

Despite these limitations, the implications drawn from the results of this study are valuable and novel as it examines the various negative influences of smartphone usage in the everyday life of healthcare professionals. Since no existing studies are using validated scales concerning smartphone use in the field of healthcare, our results can be utilized to improve the productivity of healthcare professionals and the quality of care rendered to patients.

### CONCLUSION AND RECOMMENDATIONS

Research regarding smartphone usage in the field of medicine has increased exponentially. However, hardly any studies have examined its impact on the healthcare system and patient care. Hence, future studies should focus on prevention strategies related to the negative impacts of and addiction to smartphone usage in healthcare facilities. This study showed that the excessive smartphone usage of healthcare professionals in Saudi Arabia has been affecting their personal and professional lives. In particular, its impact on their personal lives is characterized by addiction, carrying physical, social, and psychological risks.

Still, despite the negative impact of smartphone usage, its advantages in improving healthcare are evident. This emphasizes the need for regulatory agencies to introduce efficient ways of dealing with the various effects of smartphones, firmly regulating and monitoring their use in healthcare facilities. These measures will improve the personal and professional lives of healthcare providers, ultimately enhancing healthcare services to the patient, ensuring a healthy community and prosperous nation benefitting humanity at large.

### DECLARATIONS

#### Funding Sources

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

#### Acknowledgments

The authors would like to thank the participants and Saudi Commission for Health Specialties.

#### Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### REFERENCES

- [1] Moghaddam, Gita Khalili, and Christopher R. Lowe. "Health and wellness measurement approaches for mobile healthcare." *Springer*, 2019.
- [2] Oviedo-Trespalacios, Oscar, et al. "Problematic use of mobile phones in Australia... is it getting worse?" *Frontiers in Psychiatry*, Vol. 10, 2019, p. 105.
- [3] Vearrier, Laura, Kyle Rosenberger, and Valerie Weber. "Use of personal devices in healthcare: Guidelines from a roundtable discussion." *Journal of Mobile Technology in Medicine*, Vol. 7, No. 2, 2018, pp. 27-34.
- [4] Yahya, H. "Healthcare-related smartphone use among doctors in hospitals in Kaduna, Nigeria-A Survey." *Nigerian Journal of Clinical Practice*, Vol. 22, No. 7, 2019, pp. 897-905.
- [5] Gill, Preetinder S., Ashwini Kamath, and Tejkaran S. Gill. "Distraction: an assessment of smartphone usage in health care work settings." *Risk Management and Healthcare Policy*, Vol. 5, 2012, pp. 105-14.
- [6] Aljohani, Khalid A. "Smartphone use among healthcare providers in Saudi Arabia: a cross-sectional study." *International Journal of Scientific Study*, Vol. 6, No. 2, 2018, pp. 76-79.

- 
- [7] Altamimi, Tahani N., et al. "Development and validation of a Smartphone Impact Scale among healthcare professionals." *Journal of Taibah University Medical Sciences*, Vol. 15, No. 5, 2020, pp. 387-97.
- [8] Abolfotouh, Mostafa A., et al. "Use of smartphone and perception towards the usefulness and practicality of its medical applications among healthcare workers in Saudi Arabia." *BMC Health Services Research*, Vol. 19, No. 1, 2019, pp. 1-8.
- [9] Patel, Rikesh K., et al. "AUK perspective on smartphone use amongst doctors within the surgical profession." *Annals of Medicine and Surgery*, Vol. 4, No. 2, 2015, pp. 107-12.
- [10] Alameddine, Mohamad, et al. "The use of smart devices by care providers in emergency departments: Cross-sectional survey design." *JMIR mHealth and uHealth*, Vol. 7, No. 6, 2019, p. e13614.
- [11] Alhazmi, Alaa Aziz, et al. "Prevalence and factors associated with smartphone addiction among medical students at King Abdulaziz University, Jeddah." *Pakistan Journal of Medical Sciences*, Vol. 34, No. 4, 2018, pp. 984-88.
- [12] Park, Chang Sup. "Examination of smartphone dependence: Functionally and existentially dependent behavior on the smartphone." *Computers in Human Behavior*, Vol. 93, 2019, pp. 123-28.
- [13] Vahedi, Zahra, and Alyssa Saiphoo. "The association between smartphone use, stress, and anxiety: A meta-analytic review." *Stress and Health*, Vol. 34, No. 3, 2018, pp. 347-58.
- [14] Kawada, Takahiro, et al. "The relationship between a night usage of mobile phone and sleep habit and the circadian typology of Japanese students aged 18-30 yrs." *Psychology*, Vol. 8, No. 6, 2017, pp. 892-902.
- [15] Tran, Kim, et al. "Medical students and personal smartphones in the clinical environment: the impact on confidentiality of personal health information and professionalism." *Journal of Medical Internet Research*, Vol. 16, No. 5, 2014, p. e132.
- [16] Roguljić, Marija, et al. "What patients, students and doctors think about permission to publish patient Photographs in academic journals: a cross-sectional survey in Croatia." *Science and Engineering Ethics*, 2019, pp. 1229-47.
- [17] Oh, Yoon S., et al. "A Review of the Effect of Nurses' Use of Smartphone to Improve Patient Care." *Journal of Undergraduate Research in Alberta*, Vol. 6, 2017, pp. 32-39.
- [18] Cavari, Yuval, et al. "Healthcare workers mobile phone usage: A potential risk for viral contamination. Surveillance pilot study." *Infectious Diseases*, Vol. 48, No. 6, 2016, pp. 432-35.
- [19] Panigrahi, Sunil Kumar, et al. "Covid-19 and mobile phone hygiene in healthcare settings." *BMJ Global Health*, Vol. 5, No. 4, 2020, p. e002505.