Article published online: 2024-10-04

Smartphone Addiction: Impact, Challenges, and Effects on Cognition Skills among the Dental Students in the Kingdom of Saudi Arabia

Tahsinul Haque[1] Tameem Hamad[2] Sokina Abdulmalik[2] Razan Abudiab[2] Hadeel Bawazir[2] Mohammed Malik Afroz[3] Rawa Abdelrahim[1] Sajida Husna[4] Fatema Akhter[3]

[1] Department of Preventive Dental Sciences, College of Dentistry, Dar Al Uloom University, Riyadh, Saudi Arabia
[2] College of Dentistry, Dar Al Uloom University, Riyadh, Saudi Arabia
[3] Department of Surgical and Diagnostic Sciences, College of Dentistry, Dar Al Uloom University, Riyadh, Saudi Arabia
[4] Department of Oral Pathology and Microbiology, Mallareddy Institute of Dental Sciences, KNR University of Health Sciences, Hyderabad, India

Address for correspondence Fatema Akhter, PhD, Department of Surgical and Diagnostic Sciences, College of Dentistry, Dar Al Uloom University, Riyadh 13314, Saudi Arabia (e-mail: mstfatima@dau.edu.sa).

Eur J Gen Dent

Abstract

Objective Smartphones are multifunctional devices providing a range of beneficial technologies and applications that support communication, socialization, entertainment, and education but also have a few disadvantages related to overdependence among students in general and more specifically with its effects seen in cognition among professional ones such as dental students. This study aims to explore the effect of smartphones on the academic and clinical performance of undergraduate and internship dental students in universities of the Kingdom of Saudi Arabia.

Materials and Methods In this cross-sectional study, the data were collected using 32 questionnaire-based Google forms which the concerned academic level students filled. The first part included 5 questions related to demographic data, while the second part included 24 questions assessing smartphone addiction and its impact on academic performance; furthermore, the last part of the survey has 3 questions inquiring about the effect of smartphones on clinical performance.

Results Five-point Likert scale was used which has shown that as the level of study increases, smartphone use has also increased gradually. There was a positive correlation to the ill effects of high use of smartphones ranging from the patient himself experiencing high use of his device and often leading to lack of sleep. In contrast, some positive outcomes were related to the participants not using their devices while in the clinical atmosphere largely associated with the strict infection control protocol and self-awareness.

Discussion Our findings can be correlated to various other studies that highlight the peers telling the participants about the increased risk of their smartphones and the same being felt by themselves. This highlights a positive result in the awareness campaigns being carried out and the main effect has been related to lack of sleep. A

Keywords
- smartphone addiction
- dental students' phone addiction
- cognition skill
- challenges due to smartphones

DOI https://doi.org/10.1055/s-0044-1791486.
ISSN 2320-4753.

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

high infection control protocol can limit the dependency of the students on smartphone use among the clinics, but this does not relieve the overall high-level use among dental students.

Conclusion An attempt should be made to educate the young population about the bad effects of the smartphone especially long hours of usage, bad timing, overdependence, and psychological impact. More studies are needed to assess the psychological impact of smartphone usage among this population.

Introduction

The 21st century has already provided us with a vast array of technological advances that markedly shape the ways by which we interact with the world and among them is the smartphone which can do much more than simple calling. The exact introduction of smartphones to the public and its widespread use is often conflicting because it was taken by different countries in different phases; however, the first smartphone technology was developed in 1994,[1] and the percentage of smartphone owners has exponentially increased. Smartphones have also become increasingly capable of supplementing, or even supplanting, various mental functions. With the capacity to be used as phonebooks, appointment calendars, internet portals, tip calculators, maps, gaming devices, and much more, smartphones seem capable of performing an almost limitless range of cognitive activities for us, and of satisfying many of our affective urges.[2] Hence, they are multifunctional devices providing a range of beneficial technologies and applications that support communication, socialization, entertainment, and education.[3,4] The vast emergence of information and communication technologies (ICTs) has led governments to adopt the use of ICT to deliver services to their citizens, businesses, and government constituents.[5] In the recent government, the use of the phrase E-governance has been transformed to M-governance which is a clear abbreviation of providing various government-related services through the applications on the mobile phone hence making the changes more smartphone-friendly and changing it from one way of communication to a two-way channel where the citizens have a choice to forward the relevant information with ease.[5,6] Nowadays, smartphones have become an integral element of our daily life. Smartphone use has increased in recent years among college students as it is a good source to foster interaction with people and multitasking, web-based, and e-learning, to name a few.[7] Despite the beneficial uses of smartphones, they possess a negative impact on individual's behavior and daily life.[8,9] Researchers found an association between smartphone devices and adverse effects on social life, mental health, sleeping deprivation, and concentration.[10–14] From an academic perspective, previous studies provide evidence of the negative and positive effects of smartphone utilization on students' learning activities, indicating the potential uses of smartphones in enhancing and supporting education.[15–17] There are also studies[18] which used the previous grades of students are possible indicators in their selection for medical professional colleges, but overuse of smartphone after joining can have an impact on the same students outcome. There was one of the mobile learning techniques introduced in medical education during the COVID-19 pandemic to facilitate medical students' learning through the new platforms created by the dental educators.[19] Students can use smartphones as a learning aid to attend online lectures and access the university website and online study materials.[20] Contrarily, evidence shows that improper use of smartphones may influence students' academic performance negatively due to problematic smartphone use. Based on a meta-analysis from 24 countries that explored 15- to 35-year-old individuals reported that Saudi Arabia had the highest smartphone addiction score.[21] In addition, a review assessed the relationship between smartphone use and academic performance in tertiary education and reported that some studies observed a negative association.[22]

The number of university students utilizing smartphones in the Saudi population is high.[23] Based on our search, only a few studies were conducted in Saudi Arabia to assess the impact of smartphone use on dental students.[24–28] Most studies[24,26–28] among them explored the effect of smartphone addiction on academic performance; however, the data were collected from one institution, they included only undergraduate students, and they did not assess the impact of smartphones on clinical performance. One study[25] assessed the impact on knowledge, cognitive, and psychomotor skills of the dental students at Jazan University but did not report its relationship with academic performance. There is a study[29] conducted on 20 colleges within the same university among different faculties, and it was found that smartphone addiction is common among the population. This study aimed to explore the effect of smartphones on the academic and clinical performance of undergraduate and internship dental students in universities in the Kingdom of Saudi Arabia.

Materials and Methods

This is a cross-sectional study that was conducted among undergraduate and internship students among dental college students in the Kingdom of Saudi Arabia between 2022 and 2023. The data were collected using a questionnaire to assess the impact of smartphones on academic and clinical performance. The study involves 23 dental colleges from

both private and governmental universities across the Kingdom of Saudi Arabia having a fully functional dental college within them having similar course pattern within them. Postgraduate and board students were excluded from the study. The participants were selected from dental colleges of different universities across the Kingdom of Saudi Arabia to ensure similar course patterns in their studies. The data were collected through online Google Forms and the following link of the questionnaire was sent to the participants: https://docs.google.com/forms/d/e/1FAIpQLSfXGE6B9XvCgk36AjEJTR4ZwkZkwNL2WEN2xwO24zeY7ROV9g/viewform.

Consent was taken at the start of the questionnaire, and participants were informed that their responses would remain anonymous, and information would remain confidential.

The questionnaire was adopted from a previous study conducted by Pavia et al (2016).[30] The said questionnaire was modified to include the Arabic language apart from the basic English language to make it more representative of our population; furthermore, six questions were added, and a few were modified to suit our study population. Hence, our final questionnaire has 32 questions, while the article by Pavia et al[30] had 26 questions. A pilot study was conducted for 1 month during which 50 students' responses were received, whose results are included in this study since no questions were modified from the pilot study. Still, there was an option of "do not wish to answer," but since it was not selected by any of the students in the pilot study, it was removed from the actual questionnaire. In the first part of our questionnaire, we included questions about demographics (age, sex, university, year of study, and grade point average [GPA]). The second part included 24 questions assessing smartphone addiction and its impact on academic performance. The last part of the survey has three questions inquiring about the effect of smartphones on clinical performance. The respondents were asked to select from five-point Likert scale ranging from strongly agree to strongly disagree.

Statistical Analysis

Statistical analysis was performed using Statistical Package for the Social Sciences version 23 (SPSS software version 23). For the demographic data, descriptive analysis was used (percentage and frequency) as shown in ►**Table 1**. The descriptive data comprises age, gender, year of study, and GPA. As can be seen, we selected the young population with a single specialty, that is, dentistry for our study and it comprised all the years of study. As the years progressed, mobile phone usage gradually increased but an exponential increase was seen from third year onward, during which time the students were exposed to clinical subjects.

Various dental university students were contacted for the objective of this research which is mentioned in ►**Table 2**, along with the name of the university, this helped us have an overall data of 296 students. ►**Table 2** includes most of the universities in Saudi Arabia that have a dental school and the number variation is related to our accessibility as well as some universities are younger comprising those which have completed less than a decade and hence have fewer students compared with others apart from those which are in the mega cities and those which are in the rural belt.

Table 1 Descriptive data with *N* value and percentage

Variables		*N*	%
Age	18-21	62	20.7
	21-24	179	59.7
	25-30	59	19.7
Gender	Males	167	55.7
	Females	133	44.3
Year of Study	First year	29	9.7
	Second year	28	9.3
	Third year	35	11.7
	Fourth year	62	20.7
	Fifth year	67	22.3
	Internship	79	26.3
Grade point average	<2.75	9	3.0
	2.75–3.75	45	15.0
	3.75–4.25	77	25.7
	>4.25	169	56.3
Overall sample		300	100

►**Table 3** discusses the 24 questions in our study, which describe the responses of the research group to each student. These questions are primarily aimed at self-assessment of the individual toward his use of smartphone if it can be summed up as they include whether he is aware of this excessive use, has someone informed him regarding high use of smartphone, or his awareness of change in his personal interaction with their peers. Our questions are multiple choice type and include strongly disagree, disagree, agree, and strongly agree among the categories. There are a few questions that included do not wish to respond in the pilot research, but we found this was not answered by any of our research groups suggesting redundancy in the option and hence was removed from our final study. Though the original questionnaire needed to be followed due to its acceptance by the ethics committee, in the results this option is not considered.

If we look into ►**Table 3** toward those questions whose response was answered in three-digit numbers, they fall under the category of strongly agree and disagree suggesting that the questions were clear and well framed to target our objective from the study population. Question number 6 related to "I was told more than once that I am overusing my smartphone" was answered by around 111 participants, selected as strongly agree. Question number 8 whose response is mentioned in ►**Table 3** corresponds to the question about their self-awareness of being addicted toward the smartphone, where we find the answer in three digits both disagree, by 111 subjects, and strongly agree, by 100 subjects. Question number 12 corresponding to "I have slept for less than 4 hours due to overusage of smartphone" was answered

Table 2 Different universities and colleges involved in this study

University name	*N*	%
College of Dentistry, Dar Al Uloom University	26	8.7
College of Dentistry, Riyadh Elm University	8	2.7
College of Dentistry, Al Jouf University	5	1.7
College of Dentistry, King Saud Ibn Abdulaziz University for Health Sciences	21	7.0
College of Dentistry, King Faisal University	24	8
College of Dentistry, King Saud University	18	6.0
College of Dentistry, King Khalid University	27	9.0
College of Dentistry, Prince Sattam Bin Abdulaziz	19	6.3
College of Dentistry, King Abdulaziz University	16	5.3
College of Dentistry, Princes Noura Bint Abdulrahman	15	5.0
College of Dentistry, Ibn Sina National College for Medical Studies	8	2.7
College of Dentistry, Najran University	11	3.7
College of Dentistry, Vision College	8	2.7
College of Dentistry, Butterjee Medical College	7	2.3
College of Dentistry, Hail University	12	4.0
College of Dentistry, Imam Abdulrahman Bin Faisal University	14	4.7
College of Dentistry, Al Zulfi – Majma'ah University	8	2.7
College of Dentistry, Al-Qassim University	14	4.7
College of Dentistry, Taiba University	15	5.0
College of Dentistry, Umm Al Qura University	9	3.0
College of Dentistry, Jazan University	5	1.7
College of Dentistry, Al Baha University	4	1.3
College of Dentistry, Taif University	2	0.7

by 107 people, marked as strongly agree. Finally, question number 18 related to the question "idea to use smartphone as they wake up" was also answered by 131 subjects to strongly agree hence suggesting a higher level of addiction and dependence of the study population to smartphone.

►**Table 4** highlights three questions related to the harmful effects of smartphone addiction in his clinical practice by the research group. These questions are about lack of concentration in clinical practice, pain in the wrist, and the overall harmful effect of the smartphone in relation to clinical practice. It was observed that more than 101 participants rated it as strongly disagree and pain in the wrist corresponding to question number 31 was rated as disagree by 105 participants.

Discussion

Our study comprises four questions highlighting the descriptive data. There are more male students compared with female. We have included more students from the third year onward as this is the time when the students in Saudi Arabia are introduced to the clinical practice as per the curriculum, hence there are more students between 21 and 24 years of age group. The highest number of students are seen from the internship because the study has been carried out from this level of students, and it also shows good coordination of the interns from different universities among each other as our study includes students from other universities and hence more of these categories could be included. The overall GPA is higher among the different universities of Saudi Arabia[31] culminating in the fact of a well-balanced study plan and its appropriate application thereby making the students interested in dental practice as they move ahead to a better vertical integration. This study includes universities that are old and newly formed hence a variation in the number of students from each university can be seen, furthermore, the intake of students might be different, however, our study did not concentrate on the number of students in a university but more related to the smartphone addiction among the students, As the mobile phone and its internet plans are constant among the different provinces of Saudi Arabia, hence less chances of variations in internet usage can be seen. Accordingly, there are various side effects of continuous use of smartphones such as headaches due to high screen time for modern devices are coming up with an active information protocol showing the user his overall usage per week and his time spent on the specific application, but this goes toward more educating the patient rather than stopping his addiction,[32] loss of hearing, neck pain, pain in the hands and fingers especially with youngsters as over a

Table 3 Distribution based on responses to smartphone addiction scale

Question	Strongly disagree		Disagree		Agree		Strongly agree	
	N	%	*N*	%	*N*	%	*N*	%
6	18	6	88	29.3	83	27.7	111	37
7	21	7	123	41	80	26.7	76	25.3
8	8	2.7	111	37	81	27	100	33.3
9	28	9.3	130	43.3	65	21.7	77	25.7
10	24	8	139	46.3	62	20.7	75	25
11	54	18	143	47.7	44	14.7	59	19.7
12	39	13	74	24.7	80	26.7	107	35.7
13	26	8.7	152	50.7	50	16.7	72	24
14	47	15.7	150	50	46	15.3	57	19
15	27	9	119	39.7	70	23.3	84	28
16	70	23.3	129	43	41	13.7	60	20
17	49	16.3	118	39.3	67	22.3	66	22
18	11	3.7	62	20.7	96	32	131	43.7
19	18	6	107	35.7	84	28	91	30.3
20	57	19	150	50	37	12.3	56	18.7
21	31	10.3	120	40	79	26.3	70	23.3
22	25	8.3	121	40.3	76	25.3	78	26
23	38	12.7	107	35.7	75	25	80	26.7
24	37	12.3	115	38.3	70	23.3	78	26
25	46	15.3	129	43	62	20.7	63	21
26	64	21.3	133	44.3	49	16.3	54	18
27	49	16.3	119	39.7	61	20.3	71	23.7
28	54	18	132	44	56	18.7	58	19.3
29	40	13.1	110	36.7	61	20.3	89	29.7

period the smartphones are in bigger sizes as well and have become much heavier to accommodate better features.[33] Questions numbers 6 to 30 discuss the various effects a mobile phone can inculcate among the students, and most specific was question number 6 which specifically enquires whether the students were told that they were addicted to smartphones, we found most of the students answered it as strongly agree to suggest that the students are aware of being addicted to the smartphone. A similar effect was seen in other studies[6,8,34] where the effect of smartphones on early childhood is also highlighted, where the slow to lack of development of the brain is also considered a factor of addiction to the smartphone, and also at this stage, we want to discuss about a specific study carried out by Abu Shanab (2015) who discussed this in detail with additional questions describing the symptoms of smartphone addiction. Question number 8 in our study asks the participants to self-evaluate their addiction pattern by asking them "I found that I have been hooked up with my smartphone more and more" to which most of the participants describe it as

Table 4 Distribution based on responses to the questions on the effect of smartphones on clinical performance

Question	Strongly disagree		Disagree		Agree		Strongly agree		I do not have a clinic	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%
30	101	33.7	91	30.3	29	9.7	34	11.3	45	15
31	74	24.7	105	35	40	13.3	39	13	42	14
32	96	32	99	33	25	8.3	35	11.7	45	15

strongly agree. A similar pattern was seen in other studies.[7,11,35] It was noticed that bedtime usage was higher among college students which means its use might not be for study purposes but rather to spend time on social media or other relevant websites.[33] Other studies have shown no impact of smartphone usage on bedtime by slight modification in the questioning pattern and rather being more specific[19]; however, we feel a more standardized questionnaire must be followed to understand the real impact. Question number 12 discusses about sleeping less than 4 hours due to oversmartphone usage, for which again the answer was strongly agree suggesting that the lack of sleep among the students is largely related to the overuse of smartphone. A similar finding is seen in other studies.[12–14,23,24] Most of the studies highlight the need for social education campaigns to train the students specifically and the general population at large about the ill effects of smartphone usage and lack of maintenance of breaks to manage posture at the physical level and avoid tiredness at the mental level.[12,24] We have found a variation with three specific questions related to the impact of smartphone usage and the clinical performance of the involved students, which are described in ►**Table 4**. Question number 30 asks the participants about the negative impact mobile usage has caused on clinical practice. Most of the students say it has the least impact suggesting that infection control guidelines are strictly followed in the clinic thereby not allowing them to use their smartphone devices. This is in exception to few studies which have reported that the students have shown a decrease in clinical practice.[36,37] The reason suggested in this study is that most smartphones are kept on the table by dental health care professionals; however, in our clinics, the students are not allowed to use the smartphones while they are operating on the patient and the students use protective gowns which make it difficult for them to use their devices. To question number 31 that smartphone causes pain in the neck or back due to overusage of smartphone, most participants replied as strongly disagree hence suggesting that supportive devices such as hands-free ear pieces, smartwatch usage have helped in a vast way to reduce this effect, and hence to the last question which is related to whether smartphone usage causes a severe decrease in clinical performance, the participants' response was strongly disagree suggests that it has least effect. Smartphone use is no longer restricted to student education but is also related to patient education and communication by patient to the concerned student dentists.[38,39] The concept of digital dentistry has seen a change through smartphone where the number of clinics and hospitals having their own applications allowing the patient to have any time access to their digital data and near two-way communication with the specialists at any time within their comfort zone. One of the major shortcomings of this study is to include those questions related to suggestive corrective methods from the target population or the ways in which this study group has adopted to move away from harmful effects of smartphone since most of the study group are aware of their addiction.

Conclusion

An attempt should be made to educate the young population about the bad effects of smartphones especially long hours of usage, bad timing, overdependence, lack of sleep, and psychological impact. The above factors were seen as pertinent in our study group as well as in other studies. However, its direct impact on clinical performance was not seen which could be related to the study group being not allowed to use their devices in the clinics, but more concise questions should be added to know the smartphone impact on other study components such as memorizing the knowledge and its impact on other cognition tools rather than just clinical performance. Orientation sessions should be approached regarding the effects of long-term use of smartphones in the newly enrolled students in dentistry to increase their awareness. More studies are needed to assess the psychological impact of smartphone usage among this population.

Conflict of Interest
None declared.

Acknowledgment
The authors are thankful to the Deanship of Graduate Studies and Scientific Research at Dar Al Uloom University for providing support for this project.

References

1 World Economic Forum. "IBM Created the World's First Smartphone 25 Years Ago." Available at: https://www.weforum.org/agenda/2018/03/remembering-first-smartphone-simon-ibm. Accessed March 13, 2018
2 Wilmer HH, Sherman LE, Chein JM. Smartphones and cognition: a review of research exploring the links between mobile technology habits and cognitive functioning. Front Psychol 2017;8:605
3 Boumosleh J, Jaalouk D. Smartphone addiction among university students and its relationship with academic performance. Glob J Health Sci 2017;10(01):48
4 Pavia L, Cavani P, Di Blasi M, Giordano C. Smartphone addiction inventory (SPAI): psychometric properties and confirmatory factor analysis. Comput Human Behav 2016;63:170–178
5 Bataineh M, Abu-Shanab E, Jdaitawi A M-Government in Jordan: Today and the Future, a conceptual paper presented in the Proceedings of the 4th International Conference on Information Technology (ICIT 2009), Amman, Jordan, 2009:1–9
6 Abu-Tair H, Abu-Shanab E. Mobile government services: challenges and opportunities. Int J Technol Diffus 2014;5(01):17–25
7 Han S, Yi YJ. How does the smartphone usage of college students affect academic performance? J Comput Assist Learn 2019;35(01):13–22
8 Gowthami S, Kumar SVK. Impact of smartphone: a pilot study on positive and negative effects. Int J Sci Engineering Applied Sci 2016;2(03):473–478
9 Singh MKK, Samah NA. Impact of smartphone: a review on positive and negative effects on students. Asian Soc Sci 2018;14 (11):83–89
10 Abi-Jaoude E, Naylor KT, Pignatiello A. Smartphones, social media use and youth mental health. CMAJ 2020;192(06):E136–E141
11 Wang Z, Zheng J. Relationship between smartphone usage time and mental health of college students. Rev Argent Clin Psicol 2020;29(01):177
12 Ratan ZA, Parrish A-M, Zaman SB, Alotaibi MS, Hosseinzadeh H. Smartphone addiction and associated health outcomes in adult

populations: a systematic review. Int J Environ Res Public Health 2021;18(22):12257
13 Alotaibi MS, Fox M, Coman R, Ratan ZA, Hosseinzadeh H. Smartphone addiction prevalence and its association on academic performance, physical health, and mental well-being among university students in Umm Al-Qura University (UQU), Saudi Arabia. Int J Environ Res Public Health 2022;19(06):3710
14 Alosaimi FD, Alyahya H, Alshahwan H, Al Mahyijari N, Shaik SA. Smartphone addiction among university students in Riyadh, Saudi Arabia. Saudi Med J 2016;37(06):675–683
15 Kalantarion M, Sadoughi MM, Ahmady S, Kallestrup P, Katibeh M, Khajeali N. Introducing a mobile learning model in medical education during COVID-19; a critical review. J Adv Med Educ Prof 2022;10(03):145–155
16 Olson JA, Sandra DA, Colucci ÉS, et al. Smartphone addiction is increasing across the world: a meta-analysis of 24 countries. Comput Human Behav 2022;129:107138
17 Amez S, Baert S. Smartphone use and academic performance: a literature review. Int J Educ Res 2020;103:101618
18 Hendi A, Mahfouz MS, Alqassim AY, et al. Admission grades as predictors of medical students' academic performance: a cross-sectional study from Saudi Arabia. Eur J Investig Health Psychol Educ 2022;12(11):1572–1580
19 Wang Y, Lu Y, Tian X, Liu Y, Ma W. The relationship between mobile phone addiction and time management disposition among Chinese college students: a cross-lagged panel model. Heliyon 2024;10(03):e25060
20 Yu F, Conway AR. Mobile/smartphone use in higher education. Proceedings of the 2012 Southwest Decision Sciences Institute, 2012:831–839
21 Alotaibi MS, Fox M, Coman R, Ratan ZA, Hosseinzadeh H. Perspectives and experiences of smartphone overuse among university students in Umm Al-Qura University (UQU), Saudi Arabia: a qualitative analysis. Int J Environ Res Public Health 2022;19(07):4397
22 Demirci K, Akgönül M, Akpinar A. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. J Behav Addict 2015;4(02):85–92
23 Thomée S. Mobile phone use and mental health. a review of the research that takes a psychological perspective on exposure. Int J Environ Res Public Health 2018;15(12):2692
24 Venkatesh E, Jemal MYA, Samani ASA. Smart phone usage and addiction among dental students in Saudi Arabia: a cross sectional study. Int J Adolesc Med Health 2017;31(01):
25 Basheer SN, Arishi TM, Albar N, Peeran SW, Peeran SA, Zameer M. Smartphone addiction and its impact on knowledge, cognitive, and psychomotor skills of the dental students at Jazan University. World J Dent 2020;11(06):468–473
26 Amidtaher M, Saadatmand S, Moghadam Z, Fathi G, Afshar R. The relationship between mobile cellphone dependency, mental health and academic achievement. Am J Educ Res 2016;4(05):408–411
27 Verma J, Panda AR. Breaking the chains: exploring the correlation between smartphone addiction and academic performance among university students. Ann Multi-Disciplinary Res 2021;11 (IV):224–230
28 Ibrahim NK, Baharoon BS, Banjar WF, et al. Mobile phone addiction and its relationship to sleep quality and academic achievement of medical students at King Abdulaziz University, Jeddah, Saudi Arabia. J Res Health Sci 2018;18(03):e00420
29 Zhang J, Zeng Y. Effect of college students' smartphone addiction on academic achievement: the mediating role of academic anxiety and moderating role of sense of academic control. Psychol Res Behav Manag 2024;17:933–944
30 Pavia L, Cavani P, Di Blasi M, Giordano C. Smartphone addiction inventory (SPAI): psychometric properties and confirmatory factor analysis. Comput Human Behav 2016;63:170–178
31 Abu-Shanab E. The influence of smart phones on human health and behavior: Jordanians' perceptions. Int J Comp Net Appl 2015;2 (02):52–56
32 How to Check How Much Time You're Spending on Your Phone. Available at: https://www.twilio.com/en-us/blog/how-much-time-youre-spending-on-your-phone. Accessed January 19, 2022
33 Ahmed I, Qazi T, Khadija P. Mobile phone to youngsters: necessity or addiction. Afr J Bus Manag 2011;5(32):12512–12519
34 Park C, Park R. The conceptual model on smart phone addiction among early childhood. Int J Soc Sci Humanit 2014;4(02):147–150
35 Li L, Wang L, Wang X. Effect of smartphone use before bedtime on smartphone addiction behaviors among Chinese college students. Front Psychol 2022;13:1023245
36 Walia SS, Manchanda A, Narang RS, N A,Singh B, Kahlon SS. Cellular telephone as reservoir of bacterial contamination: myth or fact. J Clin Diagn Res 2014;8(01):50–53
37 Singh S, Acharya S, Bhat M, Rao SK, Pentapati KC. Mobile phone hygiene: potential risks posed by use in the clinics of an Indian dental school. J Dent Educ 2010;74(10):1153–1158
38 Zehra T, Shabbir J, Najmi N, et al. Viewing of clinical cases on social media by dentists: a cause of motivation or dissatisfaction? J Taibah Univ Med Sci 2023;18(06):1608–1615
39 Khurshid Z. Digital dentistry: transformation of oral health and dental education with technology. Eur J Dent 2023;17(04): 943–944