

# Smartphone addiction: Impact, challenges, and effects on cognition skills among the dental students in KSA

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*Abstract: 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 over-dependence among students in general and more specifically with its effects seen in cognition among professional ones like dental students. Explore the impact of smartphones on the academic and clinical performance of undergraduate and internship dental students in universities of the Kingdom of Saudi Arabia (KSA). This cross-sectional study collected the data using 32 questionnaire-based Google forms filled out by the concerned academic level students. The first part included five questions related to demographic data, while the second part included 24 items assessing smartphone addiction and its impact on academic performance. Furthermore, the last part of the survey has three questions inquiring about the effect of smartphones on clinical performance. Five-scaled Likert was used, showing that as the study level 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, which often leads to a lack of sleep. In contrast, some positive outcomes were related to the participants not using their devices in the clinical atmosphere, primarily associated with the strict infection control protocol and self-awareness. 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 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. An attempt should be made to educate the young population about the harmful effects of smartphones, exceptionally long hours of usage, lousy timing, over-dependence, and psychological impact. More studies are needed to assess the psychological effect of smartphone usage among this population.*

*Keywords: Smartphone addiction, dental students' phone addiction, cognition loss, challenges due to smartphones.*

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## INTRODUCTION

The 21st century has already provided us with vast technological advances that markedly shape how we interact with the world. The smartphone can do much more than simple calling among them.

The exact introduction of smartphones to the public and their widespread use are often conflicting because different countries took it in various phases; however, the first Smartphone technology was developed in 1994 (Abi-Jaoude et al., 2020), and the percentage of smartphone owners has exponentially increased. Smartphones have also become increasingly capable of supplementing or 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 (Wilmer et al., 2017). Hence, they are multifunctional devices providing a range of beneficial technologies and applications that support communication, socialization, entertainment, and education (Boumosleh and Jaalouk, 2018; Pavia et al., 2016). The vast emergence of Information and Communication Technologies (ICTs) has led governments to adopt ICT to deliver services to their citizens, businesses, and government constituents (Bataineh et al., 2009). In the recent government, the use of the phrase E-governance has been transformed to M – governance, which is an unambiguous abbreviation of providing various government-related services through the applications (Apps) on the mobile phone hence making the changes more smartphone-friendly and changing it from one way of communication to a 2-way channel where the citizens have a choice to forward the relevant information with ease (Abu-Shanab and Haddad, 2015; Bataineh et al., 2009).

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 for fostering interaction with people and multitasking, as well as being web-based and e-learning, to name a few (Han and Yi, 2019). Despite the beneficial uses of smartphones, they negatively impact individual's behavior and daily life (Gowthami and Kumar, 2016; Singh and Samah, 2018). Researchers found an association between smartphone devices and adverse effects on social life, mental health, sleeping deprivation, and concentration (Abi-Jaoude et al., 2020; Wang and Zheng, 2020).

From an academic perspective, previous studies provide evidence of smartphone utilization's negative and positive effects on students' learning activities, indicating the potential uses of smartphones in enhancing and supporting education (Kalantarion et al., 2022; Olson et al., 2022). They are one of the mobile learning techniques introduced in medical education during the COVID-19 pandemic to facilitate medical students' learning. Students can use smartphones as a learning aid to attend online lectures and access the university website and online study materials (Yu and Conway, 2012).

Contrarily, evidence shows that improper use of smartphones may negatively influence students' academic performance due to problematic smartphone use. Based on a meta-analysis from 24 countries that explored 15 to 35-year-olds reported that Saudi Arabia had the highest smartphone addiction score (Alotaibi et al., 2022a). 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 (Demirci et al., 2015).

The number of university students utilizing smartphones in the Saudi population is high (Thomé, 2018). Based on our search, only four studies were conducted in Saudi Arabia. Limited studies assessed smartphone use's impact on dental students (Ibrahim et al., 2018). Two studies (Basheer et al., 2020; Venkatesh et al., 2019) explored the effect of smartphone addiction on academic performance; however, the data was collected from one institution, they included only undergraduate students, and they didn't assess the impact of smartphones on clinical performance. One study (Hendi et al., 2022) assessed the Impact on Knowledge, Cognitive, and Psychomotor Skills of the Dental Students at Jazan University but didn't report its relationship with academic performance. Hence, 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 (KSA).

## METHODOLOGY

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

study involves private and governmental universities with a fully functional dental college. Postgraduate and board students were excluded from the study. The sample size involved random participants selected from different universities across the Kingdom to ensure students had similar course patterns in the study. The data was 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 obtained at the start of the questionnaire, and participants were informed that their responses would remain anonymous and that information would remain confidential.

The questionnaire was adopted from a previous study (Pavia et al., 2016) and published in 2016. The said questionnaire was modified to include the Arabic language apart from the primary 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 had 32 questions, while the article by (Pavia et al., 2016) had 26 questions. In the first part of our questionnaire, we included questions about demographics (age, sex, university, year of study, and GPA). The second part included 24 items 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 Likert scales ranging from strongly agree to strongly disagree.

#### Statistical analysis:

Statistical analysis was performed using Statistical Package for the Social Sciences version 23 (SPSS software 23 version). Descriptive analysis (percentage and frequency) was used for the demographic data, 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, i.e., dentistry, for our research, and it comprised all the years of study. As the years progressed, mobile phone usage has gradually increased, but an exponential increase was seen from 3rd year onwards, during which time the students are exposed to clinical subjects.

**Table 1:** Shows 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	1 <sup>st</sup> year	29	9.7
	2 <sup>nd</sup> year	28	9.3
	3 <sup>rd</sup> year	35	11.7
	4 <sup>th</sup> year	62	20.7
	5 <sup>th</sup> year	67	22.3
	Internship	79	26.3
GPA	<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 2 describes the dental schools from various universities contacted for this study. As we contacted various universities within Saudi Arabia, we were able to collect a lot of reliable data for our research.

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**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
King Faisal University, College of Dentistry	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, Qassim University	8	2.7
College of Dentistry, Alrass – Qassim University	6	2.0
College of Dentistry, Taiba University	15	5.0
College of Dentistry, Umm Al Qura University	9	3.0
College of dentistry Alexandria university	1	0.3
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

It discusses the total number of questions involved in our study, which is 23, and describes the responses of the research group to each student. All our questions were based on the strongly disagree, Disagree, Agree, and strongly agree categories. A few questions included do not wish to respond in the pilot research. Still, we found that none of our research groups answered this, suggesting redundancy in the option. Hence, it was removed from our final study—however, the original questionnaire needed to be followed due to its acceptance by the ethics committee. In the results, this option is not considered (Table 3).

**Table 3:** Distribution based on responses to Smartphone Addiction Scale

Item Q	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

There are a total of 4 questions that were related to the harmful effects of smartphone addiction experienced by the research group, which is highlighted in Table – 4.

**Table 4:** distribution based on responses to the items on the effect of smartphones on clinical performance

Item Q	Strongly disagree		Disagree		Agree		Strongly agree		I don't 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

**DISCUSSION**

Our study comprises four questions highlighting the descriptive data. There are more male students than females. We have included more students from the 3rd year onwards 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. 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 universities of Saudi Arabia (Abu-Shanab and Haddad, 2015), culminating in a well-balanced study plan and its appropriate application, thereby making the students interested in dental practice as they move ahead to 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 smartphone addiction among the students as mobile phone and internet plans are constant among the different provinces of Saudi Arabia; hence, chances of variations in internet usage can be seen.

Accordingly, there are various side effects of continuous use of smartphones, like headaches due to high screen time. 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 towards more educating the patient rather than stopping his addiction (Abu-Shanab and Haddad, 2015; Ahmed and Perji, 2011). Loss of hearing, neck pain, and pain in the hands and fingers, especially among youngsters, as smartphones have been more significant over time and have become much heavier to accommodate better features (Ahmed and Perji, 2011).

Questions numbers 6 to 30 discuss the various effects a mobile phone can inculcate among the students. Most specific was question number 6, which enquires explicitly whether the students were told they were addicted to smartphones. We found that most of the students answered it firmly, suggesting that the students are aware of being addicted to the smartphone. A similar effect was seen in other studies (Abu-Shanab and Haddad, 2015; Park and Park, 2014) where the impact of smartphones on early childhood is also highlighted, where the slow 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 a specific study carried out by (Abu-Shanab and Haddad, 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 strongly agreeing. A similar pattern was seen in other studies (Han and Yi, 2019; Li et al., 2022; Wang and Zheng, 2020). It was noticed that bedtime usage was higher among college students, meaning it might not be for study purposes but rather for spending time on social media

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or other relevant websites (Li et al., 2022). Other studies have shown no impact of smartphone usage on bedtime by slight modification in the questioning pattern and instead being more specific (Wang et al., 2024). However, a more standardized questionnaire must be followed to understand the impact.

Question number 12 discusses sleeping less than 4 hours due to over-smartphone usage, for which again the answer was strongly agreed suggesting that the lack of sleep among the students is primarily related to smartphone overuse. A similar finding is seen in other studies (Alotaibi et al., 2022b; Ratan et al., 2021). 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 (Ratan et al., 2021; Venkatesh et al., 2019). We have found a variation with three specific questions related to the impact of smartphone usage and the clinical performance of the involved students, described in Table 4. Question Number 30 asks the participants about the harmful impact mobile usage has caused on clinical practice.

Most students say it has the most negligible impact, suggesting that infection control guidelines are strictly followed in the clinic, thereby preventing them from using their smartphone devices. This is an exception to a few studies that reported that the students had shown a decrease in clinical practice (Singh et al., 2010; Walia et al., 2014). 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 the question from number 31 that smartphone causes pain in the neck or back due to over usage of smartphones, most participants replied as strongly disagree, hence suggesting that supportive devices like hands-free earpieces and smartwatch usage have helped in a vast way to reduce this effect. Therefore, in the last question, related to whether smartphone usage causes a severe decrease in clinical performance, the participants strongly disagree, suggesting that it has the most minor effect.

## CONCLUSION

An attempt should be made to educate the young population about the harmful effects of smartphones, exceptionally long hours of usage, lousy timing, over-dependence, and psychological impact. Orientation sessions should be approached regarding the effects of long-term use of smartphones on newly enrolled dental students and should increase their awareness.

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## REFERENCES

- Abi-Jaoude, E., K.T. Naylor, and A. Pignatiello. 2020. Smartphones, social media use and youth mental health. *Cmaj*. 192:E136-E141.
- Abu-Shanab, E., and E. Haddad. 2015. The influence of smart phones on human health and behavior: Jordanians' perceptions. *International Journal of Computer Networks and Applications*. 2:52-56.
- Ahmed, I., and K.A. Perji. 2011. Mobile phone to youngsters: Necessity or addiction. *Information Management and Business Review*. 2:229-238.
- Alotaibi, M.S., M. Fox, R. Coman, Z.A. Ratan, and H. Hosseinzadeh. 2022a. Perspectives and experiences of smartphone overuse among university students in Umm Al-Qura University (UQU), Saudi Arabia: a qualitative analysis. *International Journal of Environmental Research and Public Health*. 19:4397.
- Alotaibi, M.S., M. Fox, R. Coman, Z.A. Ratan, and H. Hosseinzadeh. 2022b. 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. *International journal of environmental research and public health*. 19:3710.

- Basheer, S.N., T.M. Arishi, N. Albar, S.W. Peeran, S.A. Peeran, and M. Zameer. 2020. Smartphone Addiction and Its Impact on Knowledge, Cognitive, and Psychomotor Skills of the Dental Students at Jazan University. *Dent.* 11:468-473.
- Bataineh, M., E. Abu-Shanab, and A. Jdaitawi. 2009. M-government in Jordan: Today and the future. In *Proceedings of the 4th International Conference in Information Technology, Amman.* 3-5.
- Boumosleh, J., and D. Jaalouk. 2018. Smartphone addiction among university students and its relationship with academic performance. *Global Journal of Health Science.* 10:48-59.
- Demirci, K., M. Akgönül, and A. Akpınar. 2015. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. *Journal of behavioral addictions.* 4:85-92.
- Gowthami, S., and S. Kumar. 2016. Impact of smartphone: A pilot study on positive and negative effects. *International Journal of Scientific Engineering and Applied Science (IJSEAS).* 2:473-478.
- Han, S., and Y.J. Yi. 2019. How does the smartphone usage of college students affect academic performance? *Journal of Computer Assisted Learning.* 35:13-22.
- Hendi, A., M.S. Mahfouz, A.Y. Alqassim, A. Makeen, M. Somaili, M.O. Shami, A.A. Names, A. Darraj, A. Kariri, and A. Ashiri. 2022. Admission grades as predictors of medical students' academic performance: a cross-sectional study from Saudi Arabia. *European Journal of Investigation in Health, Psychology and Education.* 12:1572-1580.
- Ibrahim, N.K., B.S. Baharoon, W.F. Banjar, A.A. Jar, R.M. Ashor, A.A. Aman, and J.R. Al-Ahmadi. 2018. Mobile phone addiction and its relationship to sleep quality and academic achievement of medical students at King Abdulaziz University, Jeddah, Saudi Arabia. *Journal of research in health sciences.* 18:e00420.
- Kalantarion, M., M.-M. Sadoughi, S. Ahmady, P. Kallestrup, M. Katibeh, and N. Khajeali. 2022. Introducing a mobile learning model in medical education during COVID-19; a critical review. *Journal of Advances in Medical Education & Professionalism.* 10:145.
- Li, L., L. Wang, and X. Wang. 2022. Effect of smartphone use before bedtime on smartphone addiction behaviors among Chinese college students. *Frontiers in Psychology.* 13:1023245.
- Olson, J.A., D.A. Sandra, É.S. Colucci, A. Al Bikaii, D. Chmoulevitch, J. Nahas, A. Raz, and S.P. Veissière. 2022. Smartphone addiction is increasing across the world: A meta-analysis of 24 countries. *Computers in Human Behavior.* 129:107138.
- Park, C., and Y.R. Park. 2014. The conceptual model on smart phone addiction among early childhood. *International Journal of Social Science and Humanity.* 4:147.
- Pavia, L., P. Cavani, M. Di Blasi, and C. Giordano. 2016. Smartphone Addiction Inventory (SPAI): Psychometric properties and confirmatory factor analysis. *Computers in Human Behavior.* 63:170-178.
- Ratan, Z.A., A.-M. Parrish, S.B. Zaman, M.S. Alotaibi, and H. Hosseinzadeh. 2021. Smartphone addiction and associated health outcomes in adult populations: a systematic review. *International journal of environmental research and public health.* 18:12257.
- Singh, M.K.K., and N.A. Samah. 2018. Impact of smartphone: A review on positive and negative effects on students. *Asian Social Science.* 14:83-89.
- Singh, S., S. Acharya, M. Bhat, S.K. Rao, and K.C. Pentapati. 2010. Mobile phone hygiene: potential risks posed by use in the clinics of an Indian dental school. *Journal of Dental Education.* 74:1153-1158.
- Thomé, S. 2018. Mobile phone use and mental health. A review of the research that takes a psychological perspective on exposure. *International journal of environmental research and public health.* 15:2692.
- Venkatesh, E., M.Y. Al Jemal, and A.S. Al Samani. 2019. Smart phone usage and addiction among dental students in Saudi Arabia: a cross sectional study. *International Journal of Adolescent Medicine and Health.* 31.
- Walia, S.S., A. Manchanda, R.S. Narang, N. Anup, B. Singh, and S.S. Kahlon. 2014. Cellular telephone as reservoir of bacterial contamination: myth or fact. *Journal of clinical and diagnostic research: JCDR.* 8:50.
- Wang, Y., Y. Lu, X. Tian, Y. Liu, and W. Ma. 2024. The relationship between mobile phone addiction and time management disposition among Chinese college students: A cross-lagged panel model. *Heliyon.*
- Wang, Z., and J. Zheng. 2020. Relationship between smartphone usage time and mental health of college students. *Revista Argentina de Clínica Psicológica.* 29:177.

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- Wilmer, H.H., L.E. Sherman, and J.M. Chein. 2017. Smartphones and cognition: A review of research exploring the links between mobile technology habits and cognitive functioning. *Frontiers in psychology*. 8:251723.
- Yu, F., and A. Conway. 2012. Mobile/smartphone use in higher education. *Proceedings of the 2012 Southwest Decision Sciences Institute*:831-839.