The Impact of Smartphone Addiction on the Sleeping Patterns of Undergraduate Healthcare Students at Islam Medical and Dental College – A Cross-Sectional study

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Introduction
Since the first cell phone was introduced in 1973 by Motorola and the iPhone by Apple in 2007, using a mobile phone has become a commonplace aspect of daily life. With calendars, emails, and fast access to encyclopedias across numerous fields, smartphones provide us with complete power at our fingertips. The smartphone has become the go-to gadget for social media, other telecommunication services, and internet access because of its convenient mobility. (1,2) In addition to this, smartphones can be a major help in improving patient care and play a promising strategy in medical education. Applications of it might help medical students and healthcare workers become more knowledgeable and proficient. (3,4) Despite the advantages, medical students have become addicted to their smartphones, which has a negative impact on their psychological and social well-being. The threats to mental and psychological health posed by radiofrequency electro-magnetic fields (RF-EMF) are attracting the attention of medical researchers. (5)

The truth is that modern smartphones are misused and have the potential for contributing to addiction. The potential health risks associated with excessive mobile phone usage have recently come to the attention of the World Health Organization, and some academics have even proposed a new type of behavioral addiction. There fails to be any agreement on what constitutes smartphone addiction. Consequently, the phrase "problematic smartphone use" is used increasingly often to define a persistent inability to exercise control in the addictive conduct that causes misery or functional impairment. According to the criteria for behavioral addiction put forward by Kardefelt-Winther et al., this failure fits into the description. (6)

The latest edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) classifies behavioral addiction, or gambling addiction, as a "substance-related and addictive disorder." (7) The DSM-5 criteria for substance-related disorders and smartphone addiction have a number of traits, including the four main components of compulsive behavior, impairment of function, withdrawal, and tolerance. (7) One of the most common types of addiction among younger

generations is problematic smartphone usage, which is defined as the excessive and unproductive use of smartphones combined with an overwhelming level of tolerance and dependency. (8) According to the Organization for Economic Cooperation and Development (OECD), people between the ages of 14 and 24 spend an average of 4.5 hours per day on the Internet. (9) An individual swipes through their smartphone around 200 times a day. (10)

Pakistan already has more people using smartphones than it did in 2000 (0.31), rising to 175.62 million in 2020 and reaching 192 million in March 2022. There are 50 million Facebook users, 45 million YouTube users, 3.7 million Twitter users, 31.2 million TikTok users, 20 million Snack Video users, 3 million Likee users, 0.5 BIGOLIVE users, and 117 million Google users in Pakistan, according to PTA 2021 figures. (11) However the increasing usage of smartphone use can also result in a pathological addiction to the device and a desire for it, which can cause a disorder known as "Nomophobia". Neologism nomophobia (no-mobile-phone-phobia) refers to the dread of being without your phone. The symptoms of nomophobia disorder include an unreasonable fear or anxiety that prevents a person from possessing or using a phone, running out of charge, or losing an internet connection, all of which rob a person of continual contact. (12, 13)

Health might be indicated by the quality of an individual's sleep. (14) Research indicates that smartphones negatively impact the quality of one's sleep. Students' sleep quality is negatively impacted by smartphone addiction, which compromises their mental and physical well-being. (15-17) According to a 2019 meta-analysis, the majority of the studies (n = 31) reported between 10 and 30% of children and young adults, with a median of 23.3%, having a smartphone addiction. Additionally, there was a significant correlation between smartphone use and poor sleep, depression, anxiety, stress, and daily functional impairment. (18) A recent survey conducted in the USA found that 32.6% of individuals have poor sleep quality. 97% of Iranian university students and 44% of South Indian students are susceptible to academic stress and poor sleep quality as a result of smartphone addiction. (19) According to some psychologists, smartphone addiction and associated psychological issues represent a new COVID-19 pandemic hidden disaster. (20) Numerous research conducted over the previous few years have also documented links between COVID-19 psychiatric issues and smartphone addiction. Furthermore, it seems that sleep disorders were prevalent throughout the continuing COVID-19 epidemic. A recent meta-analysis by Alimoradi et al. identified a correlation between greater levels of psychological distress and sleep-related disorders. (21-24) Overuse of smartphones can also disrupt patterns of sleep by diminishing slowwave and rapid eye movement sleep, which can lead to sleep insufficiency. Overuse of smartphones can eventually be linked to psychosocial crises (such as anxiety, stress, mood disorders, and sleep deprivation). (25) Students who suffer from Smartphone Addiction have disruptions in their sleep quality, which is crucial for preserving their mental and physical well-being. (26) The phenomena of smartphones' blue light acting on the suprachiasmatic nucleus (SCN) through the retinohypothalamic tract to block the inhibitory action of melatonin on SCN and reduce melatonin secretion from the pineal gland might explain why smartphone addiction disrupts sleep quality. An individual's sleep cycle is disrupted by hyperactive SCN. (27) Medical students who are addicted to smartphones

experience poor sleep quality and subpar academic performance due to disruptions in their internal clock (SVN) and HPA axis, respectively. (28)

Nomophobia and smartphone addiction have been brought on by the pervasive use of smart phones, and they are detrimental to both overall health and healthy sleep patterns. The impact of these problems on the sleep patterns of undergraduate healthcare students, particularly in Pakistan, remains largely unexplored in the literature, despite a wealth of study on the subject. The majority of previous research has focused on certain university demographics, such as medical or dentistry students, and has mainly disregarded the wider range of healthcare fields. (31-32)

There has to be a careful investigation of the ways in which Pakistan's unique sociocultural context and the country's rapidly increasing smartphone usage affect medical students. The extant literature has demonstrated the prevalence of nomophobia and its correlation with suboptimal sleep quality in medical and dental students. (33,34) There is, however, a dearth of research discussing the whole impact on all healthcare students, including those pursuing allied health sciences, nursing, and pharmacy. (33)

To close this gap, this study examines the effects of nomophobia and smartphone addiction on the sleeping patterns of Pakistani undergraduate healthcare students across a range of academic fields. By doing this, it seeks to provide a more thorough understanding of the issue, which is necessary to develop targeted interventions to improve general health and sleep hygiene in this vulnerable population. (35) The findings will impact practice and policy in Pakistani healthcare and educational settings in addition to contributing to the corpus of current research.

All of the above listed study studies provide credence to our hypothesis, which states that "there is a positive correlation between smartphone addiction and its effects on sleep quality among multidisciplinary healthcare students". While prior research in Pakistan has linked smartphone addiction to negative outcomes, mostly for medical and dental students, it does not assess this important matter in connection with other aspects of the health care field. This particular detail has been overlooked, which emphasises the need for a research study that compares the degree of addiction among students in each healthcare field and carefully examines the impact of smartphone addiction on sleeping patterns across all healthcare fields (medicine, dentistry, pharmacy, physiotherapy, and nursing). Our research aims to bridge this gap by becoming the first in Pakistan to show a connection between smartphone addiction and the quality of sleep that interdisciplinary healthcare students get.

Methodology

In July 2024, a cross-sectional survey was carried out among first-year undergraduate healthcare students at Islam Medical and Dental College. A stratified probability sampling strategy was used. 175 first-year undergraduate healthcare students, comprising 35 (20%) in medicine, 35 (20%) in dentistry, 35 (20%) in pharmacy, 35 (20%) in physiotherapy, and 35 (20%) in nursing.

There were 146 female students and 29 male students out of 175 total. The age range is from 17 to 25 years old, with an accurate mean age of 19.73 ±1.79 years. Using a 95% confidence level and 5% margin of error, the sample size was

calculated using the OpenEpi, Version 3 sample size calculator with a 50% prevalence assumption.

Category	Subcategory	Frequency	Percent
Age	> 24 Years	3	1.7%
	20-24 Years	57	32.6%
	18-19 Years	113	64.6%
	17 Years	2	1.1%
Discipline	Medicine	35	20.0%
	Physiotherapy	35	20.0%
	Nursing	35	20.0%
	Dentistry	35	20.0%
	Pharmacy	35	20.0%
Gender	Male	29	16.6%
	Female	146	83.4%
Total		**175**	**100.0%**

The table above contains the demographic data for the research participants. The largest percentage of participants (64.6%) are between the ages of 18 and 19, followed by those between the ages of 20 and 24 (32.6%). The proportion of participants who are older than 24.7% or younger than 17 comprises just 1.1%.

Medical, physical therapy, nursing, dentistry, and pharmacy comprise the five disciplines, with each field accounting for 20% of the total sample. Divided equally between these places are the participants. Its equitable involvement guarantees a balanced approach from many healthcare sectors.

The gender distribution of participants reveals a strong bias in favour of females, who make up 83.4% of the sample, while males make up just 16.6%. The observed gender gap might potentially result from sample bias or accurately represent the gender distribution of undergraduate healthcare students.

Ethical Approval: The data collection team of investigators had ensured the confidentiality of the participants. We had followed the "Declaration of Helsinki"– ethical principles for medical research involving human subjects. The present research study was initiated only after receiving the appropriate ethical approval, bearing reference number 900/IMC/ERC/000102, from the Islam Medical College Institutional Ethics Review Board (IERB).

All participants conferred on written, informed consent; they were told about the objective of the study and the methodology of the questionnaires; they were also informed about the anonymity and confidentiality of their answers and any personally identifiable information; each respondent was given a code ID that

was used to tabulate and assess all the data; the names of the students were not used in the data interpretation; and their answers were kept in a password-protected file accessable only by the study's authors.

Inclusion Criteria: First-year students in the fields of Medicine, Dentistry, Nursing, Physiotherapy, and Pharmacy that used a smartphone for at least 12 months were selected. Participants were required to complete both of the questionnaires (PSQI and SAS-SV).

Exclusion Criteria: Participants who were not able to complete the questionnaires were excluded from the study. Those who had a known history of significant medical illness that leads to low quality of sleep or had any diagnosed psychiatric disorder were excluded from the study.

Case Processing Summary	Cases					
	Included		Excluded		Total	
	N	Per cent	N	Per cent	N	Per cent
SAS-SV	175	100.0%	0	0.0%	175	100.0%
PSQI	175	100.0%	0	0.0%	175	100.0%

Questionnaires

A sample of undergraduate healthcare students was randomly selected, and they were given a pre-test of the questionnaire. They were excluded from the current study's respondent group. The pre-testing was done to see if the questionnaires were appropriate for the anticipated responders.

Three sections made up the study questionnaire. The first portion of the survey was a sociodemographic questionnaire that included questions about the age, gender, discipline, and year (semester) of study of the students. The Smartphone Addiction Scale-Short Version was the second section of the questionnaire (SAS-SV). The following five dimensions are covered by the 10-item validated self-report scale, SAS-SV: (1) "daily-life disturbance," (2) "withdrawal," (3) "cyberspaceoriented relationship," (4) "overuse," and (5) "tolerance." For each item, opinions are expressed on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). A score of ≥31 in Male students and ≥33 in female students is considered significant (29). In this study, the Smartphone Addiction Scale - Short Version (SAS-SV) was used to measure the participants' level of smartphone addiction. The SAS-SV is a widely-used, verified tool developed by Kwon et al. (36) It uses a simple, reliable list of 10 items to assess smartphone addiction. This test has been used extensively to evaluate the addictive behaviours associated with smartphone usage in a variety of research settings.

The Pittsburgh Sleep Quality Index (PQSI), which measures both the quantity and quality of students' sleep, was the third portion of the questionnaire. Seven

"component" scores are produced by a total of 9 distinct items with 19 sub-sections. These scores include subjective sleep quality, subjective sleep latency, subjective sleep length, habitual sleep efficiency, sleep disruptions, usage of sleeping medicine, and dysfunction during the previous month's daylight hours. One global PSQI score is produced by adding the scores for each of these seven components. To fit our study context, the questions regarding "bed partner" were changed to "roommate." The scores for each component ranged from 0 to 3. Students are categorised as having "good sleep" if their Pittsburgh Sleep Quality Index (PSQI) global score is less than five, and as having "poor sleep" if their score is equal to or more than five. (30)

The study employed the Pittsburgh Sleep Quality Index (PSQI) to assess the quality of sleep among the participants. Created by Buysse et al. (37) to measure many aspects of sleep interruptions and quality across a month, the PSQI is a legitimate and dependable tool. This questionnaire has been widely used in clinical and research settings to evaluate sleep patterns and identify any sleep-related issues.

Descriptive Analysis

Through institutional access, IBM SPSS (Statistical Package for the Social Sciences) version 27 was used to analyse the acquired data. To ascertain the distributional features of all the variables under investigation—including the psychological well-being of the students—a descriptive analysis was carried out.

An easy-to-read assessment of the study's scales' internal consistency and applicability for assessing smartphone addiction and sleep quality in undergraduate medical students can be seen in the table below, which also highlights the scales' dependability.

Scale	Cronbach's Alpha	Number of Items
PSQI	0.775	18
SAS-SV	**0.825**	**10**

A moderate positive correlation (r = 0.407, p < 0.01) was found in the correlation study between smartphone addiction (SAS-SV) and sleep quality (PSQI) among 175 undergraduate healthcare students at Islam Medical and Dental College. This suggests that there is a significant correlation between poor sleep quality and higher degrees of smartphone addiction. The results show that students' sleep patterns may be negatively impacted by excessive smartphone usage, indicating the need for treatments to reduce smartphone addiction and enhance sleep quality for improved general health and academic achievement.

Correlations

		SAS-SV	PSQI
SAS-SV	Pearson Correlation	1	.407[**]
	Sig. (2-tailed)		.000

		175	175
PSQI	Pearson Correlation	.407**	1
	Sig. (2-tailed)	.000	
	N	175	175

**. Correlation is significant at the 0.01 level (2-tailed).

This table highlights the substantial negative influence of smartphone addiction on sleep quality among undergraduate healthcare students and offers a brief but comprehensive overview of the ANOVA results.

Source	Sum of Squares	Df	Mean Square	F
Regression	4.701	1	4.701	34.297
Residual	23.715	173	0.137	
Total	**28.417**	**174**		

In conclusion, the descriptive analysis reveals a strong correlation between smartphone addiction and poor sleep quality among undergraduate healthcare students. It was demonstrated that the SAS-SV and PSQI scales are reliable, ensuring accurate findings. The ANOVA results demonstrate the extent to which smartphone addiction impairs sleep quality, emphasising the need for targeted interventions. These findings provide a solid foundation for understanding the relationship between this demographic's use of technology and sleep habits.

Results

The totals, means, standard deviation, along with the SAS-SV, PSQI, were calculated.

The table gives an overview of smartphone addiction (SAS-SV) and sleep quality (PSQI) among 175 Islam Medical and Dental College undergraduate healthcare students by discipline. 20 percent of the sample, or medical students, had mean PSQI scores of 1.8052 (95.64% of the overall mean) and mean SAS-SV scores of 3.0743 (61.49% of the total mean), which indicated a moderate level of smartphone addiction and a generally good quality of sleep. With a mean PSQI score of 1.9740 (104.59% of the overall mean) and an SAS-SV score of 3.7600 (74.91% of the mean), physiotherapy students (20% of the sample) had a greater level of smartphone addiction and lower sleep quality. Another 20% of students were nursing students, and they had the highest sleep quality with a mean PSQI score of 1.6831 (89.17% of the overall mean) and the lowest mean SAS-SV score of 2.6657 (53.89% of the total mean). 20 percent of the sample, or dentistry students, had the highest mean PSQI score of 1.9909 (105.48% of the overall mean) and the mean SAS-SV score of 3.6600 (72.77% of the total mean), both of which indicated significant smartphone addiction and poor sleep quality. The final 20% of students, who were pharmacy students, had mean PSQI scores of

1.9844 (105.13% of the overall mean) and mean SAS-SV scores of 3.6429 (72.42% of the whole mean), which likewise indicated excessive smartphone addiction and poor sleep quality. The overall mean PSQI score was 1.8875 and the overall mean SAS-SV score was 3.3606, indicating various degrees of smartphone addiction and sleep quality in different academic fields.

Report

Discipline		SAS-SV	PSQI
Medicine	Mean	3.0743	1.8052
	N	35	35
	Std. Deviation	.87795	.28162
Physiotherapy	Mean	3.7600	1.9740
	N	35	35
	Std. Deviation	.92743	.37145
Nursing	Mean	2.6657	1.6831
	N	35	35
	Std. Deviation	1.22088	.35492
Dentistry	Mean	3.6600	1.9909
	N	35	35
	Std. Deviation	.98524	.43818
Pharmacy	Mean	3.6429	1.9844
	N	35	35
	Std. Deviation	1.15282	.47134
Total	Mean	3.3606	1.8875
	N	175	175

	Std. Deviation	1.11313	.40412

This investigation shows how specific treatments are needed to manage smartphone addiction and enhance the quality of sleep that medical students obtain.

To give an understandable overview of discipline-specific smartphone addiction and sleep quality among undergraduate healthcare students, the data was further analysed and shown using pie charts and bar charts. The representations provided make it easier to understand how addiction and sleep quality varies throughout fields and allow for a more thorough examination of the study's conclusions.

Discussion

The purpose of this study was to investigate the association between smartphone addiction and poor sleep among Islam Medical and Dental College undergraduate healthcare students. According to the hypothesis, there is a positive correlation between the degree of smartphone addiction, as determined by the SAS-SV, and particular aspects of sleep quality, such length, disruptions, and dysfunction throughout the day, as determined by the PSQI.

The first objective was to comprehend smartphone addiction and how common it is among medical students. The findings showed that different academic fields had differing degrees of smartphone addiction, with students studying dentistry and physiotherapy showing the greatest levels of addiction. This is in line with the goal of determining how common and severe smartphone addiction is among students. The mean SAS-SV scores showed notable variations in addiction levels, ranging from 2.6657 in nursing to 3.7600 in physiotherapy. The Islam Nursing College has a policy that prohibits smartphone use both during and after school hours, which may be the reason why nursing students received the lowest scores for smartphone addiction.

Analysing the effects of smartphone addiction on sleep quantity and quality was the second objective. A noteworthy positive association (r = 0.407, p < 0.01) was seen in the study between smartphone addiction and sleep quality, indicating a potential link between greater smartphone addiction levels and lower sleep quality. This result demonstrates a strong correlation between aspects of sleep quality and smartphone addiction, which validates the theory. The mean PSQI ratings showed that different disciplines had different degrees of sleep quality, ranging from 1.6831 in nursing to 1.9909 in dentistry.

Assessing the correlation between smartphone use before bed and its impact on sleep patterns was the third objective. According to the research, students who scored higher on the PSQI had a tendency to have lower-quality sleep. This was evident in their higher smartphone addiction ratings. This result validates the theory that excessive smartphone usage, especially right before bed, has a deleterious effect on the quality of sleep. The necessity for treatments to lessen smartphone addiction and enhance sleep hygiene among students is highlighted by the substantial link found between SAS-SV and PSQI scores.

The study's findings are in line with other investigations that found a strong link between smartphone addiction and sleep disorders. For example, a study by

Demirci et al. discovered that among university students, greater smartphone addiction ratings were linked to worse sleep quality and more frequent sleep disruptions.8 Similar findings were found in a research by Lin et al., which connected heavy smartphone usage before bed to decreased sleep duration and higher dysfunction throughout the day.9. These results support the current study's findings, which emphasise the detrimental effects of smartphone addiction on sleep quality.

Implications
The study's conclusions have a number of practical implications. Education establishments have to create regulations that limit smartphone usage, particularly during and after college hours, and spread knowledge about the detrimental effects of smartphone addiction on sleep quality. Improving sleep hygiene, creating focused intervention programs, and offering counselling and other support services can all help lessen smartphone addiction and enhance the quality of sleep. Incorporating lessons on sleep hygiene and digital wellbeing into the curriculum can also encourage students to adopt healthier routines. Ultimately, by teaching students about good sleep habits and responsible smartphone use, seminars and workshops can improve their general health and academic achievement.

Limitations
It is important to recognise the limitations of this study. It is challenging to determine a causal relationship between smartphone addiction and poor sleep quality since cross-sectional research only collects data at one particular moment in time. Self-reported assessments of sleep quality (PSQI) and smartphone addiction (SAS-SV) may introduce bias since individuals may over-report or underreport their experiences and behaviours. A major drawback is the institution's special rules, including limiting smartphone use for nursing students, which could not apply in other contexts and could have an impact on how comparable the results are. Future studies that address these limitations may offer a greater understanding of the connection between smartphone addiction and poor sleep.

Conclusion
In summary, this study clarifies the intricate relationship between smartphone addiction and poor sleep among medical students. As a result of the findings, focused interventions and educational initiatives are necessary to address the significant impact that excessive smartphone usage might have on sleep patterns. Colleges and universities may improve their students' academic performance and general well-being by tackling smartphone addiction and encouraging better sleep practices. In order to develop more potent tactics for preventing smartphone addiction and enhancing the quality of sleep that students receive, future studies should investigate the underlying processes behind this link in greater detail and look into other variables that could be involved.

Author's Contribution:
Following authors have made substantial contributions to the manuscript as under:

Oreed Aslam Chaudhary & Maryam Akram: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.
Oreed Aslam Chaudhary & Maryam Akram: Data acquisition, data analysis, approval of the final version to be published.
Faisal Mahmood: Critical review, concept, drafting the manuscript, approval of the final version to be published.
Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
Disclosure Statement: No potential conflict of interest was reported by the authors.

References
1) Loleski M, Loleska S, Pop-Jordanova N. Mobile Application "Neurogame" for Assessment the Attention, Focus and Concentration. PRILOZI. 2017;38(3):55-62. doi:10.2478/prilozi-2018-0006.
2) Pop-Jordanova N, Loleski M, Loleska S. The Use of Smartphone in Medical Practice. PRILOZI. 2017;38(3):9-18. doi:10.2478/prilozi-2018-00023.
3) Valle J, Godby T, Paul DP, Smith H, Coustasse A. Use of Smartphones for Clinical and Medical Education. Health Care Manag. 2017;36(3):293-300. doi:10.1097/HCM.00000000000001764.
4) Bonabi M, Mohebbi SZ, Martinez-Mier EA, Thyvalikakath TP, Khami MR. Effectiveness of smart phone application use as continuing medical education method in pediatric oral health care: a randomized trial. BMC Med Educ. 2019;19(1):431. doi:10.1186/s12909-019-1852-z.
5. Lopez-Fernandez et al. Self-reported dependence on mobile phones in young adults. 2017.
6. Kardefelt-Winther D, Heeren A, Schimmenti A, et al. How can we conceptualize behavioural addiction without pathologizing common behaviours? Addiction. 2017;112(10):1709-1715. doi:10.1111/add.13763.
7. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders: DSM-5. 5th ed. American Psychiatric Association; 2013.
8. Soni R, Upadhyay R, Jain M. Prevalence of smart phone addiction, sleep quality and associated behaviour problems in adolescents. Int J Res Med Sci. 2017;5(2):515. doi:10.18203/2320-6012.ijrms20170142.
9. OECD. Measuring the Digital Transformation: A Roadmap for the Future. OECD; 2019. doi:10.1787/9789264311992-en.
10. Aktipis A, et al. Do Smartphones Create a Coordination Problem for Financial Planning? 2020.
11. Alshobaili H, AlYousefi N. The effect of smartphone usage at bedtime on sleep. 2019.
12. Massano-Cardoso IM, Figueiredo S, Galhardo A. Nomofobia na população portuguesa em contexto pandémico: estudo comparativo antes e durante a pandemia COVID-19. Rev Port Inv Comp Soc. 2022;8(1):1-13. doi:10.31211/rpics.2022.8.1.239.
13. López Iglesias M, Tapia-Frade A, Ruiz Velasco CM. Patologías y dependencias que provocan las redes sociales en los jóvenes nativos digitales. RCyS. 2022;13:23-43. doi:10.35669/rcys.2023.13.e301.

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14. Baglioni C, Nanovska S, Regen W, et al. Sleep and mental disorders: A meta-analysis of polysomnographic research. Psychological Bulletin. 2016;142(9):969-990. doi:10.1037/bul0000053.

15. Christensen MA, Bettencourt L, Kaye L, et al. Direct Measurements of Smartphone Screen-Time: Relationships with Demographics and Sleep. Romigi A, ed. PLoS ONE. 2016;11(11):e0165331. doi:10.1371/journal.pone.0165331.

16. Demirci K, Akgönül M, Akpinar A. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. *JBA*. 2015;4(2):85-92. doi:10.1556/2006.4.2015.010

17. Ghulam Mujtaba Nasir, Ghulam Dastgeer, Muhammad Umar Khan, Afshan Batool, Ahmad Naseer Khan, Aneesa Altaf. Correlation of Smart Phone Addiction with Poor Sleep Quality and Low Academic Score in Medical Students of Nishtar Medical University, South Punjab. *Ann Pak Inst Med Sci*. 2023;19(3):328-332. doi:10.48036/apims.v19i3.729

18. Sohn SY, Rees P, Wildridge B, Kalk NJ, Carter B. Prevalence of problematic smartphone usage and associated mental health outcomes amongst children and young people: a systematic review, meta-analysis and GRADE of the evidence. *BMC Psychiatry*. 2019;19(1):356. doi:10.1186/s12888-019-2350-x

19. Thomée S, Härenstam A, Hagberg M. Mobile phone use and stress, sleep disturbances, and symptoms of depression among young adults - a prospective cohort study. *BMC Public Health*. 2011;11(1):66. doi:10.1186/1471-2458-11-66

20. Ratan ZA, Zaman SB, Islam SMS, Hosseinzadeh H. Smartphone overuse: A hidden crisis in COVID-19. *Health Policy and Technology*. 2021;10(1):21-22. doi:10.1016/j.hlpt.2021.01.002

21. Luo X, Estill J, Wang Q, et al. The psychological impact of quarantine on co ronavirus disease 2019 (COVID-19). Psychiatry Res. 2020;291:113193. doi:10.1016/j.psychres.2020.113193.

22. Goethals L, Barth N, Guyot J, et al. Impact of Home Quarantine on Physica l Activity Among Older Adults Living at Home During the COVID-19 Pandemic: Qualitative Interview Study. JMIR Aging. 2020;3(1):e19007. doi:10.2196/19007.

23. Mattioli AV, Sciomer S, Cocchi C, et al. Quarantine during COVID-19 outbreak: Changes in diet and physical activity increase the risk of cardi ovascular disease. Nutr Metab Cardiovasc Dis. 2020;30(9):1409-1417. doi:10.1016/j.numecd.2020.05.020.

24. Alimoradi Z, Broström A, Tsang HWH, et al. Sleep problems during COVID 19 pandemic and its association to psychological distress: A systematic revi ew and meta-analysis. EClinicalMedicine. 2021;36:100916. doi:10.1016/j.eclinm.2021.100916.

25. Király O, Potenza MN, Stein DJ, et al. Preventing problematic internet use during the COVID-19 pandemic: Consensus guidance. Compr Psychiatry. 2020;100:152180. doi:10.1016/j.comppsych.2020.152180.

26. Thomée S, et al. Mobile phone use and stress, sleep disturbances, and symptoms of depression among young adults. BMC Public Health. 2011;11(1):66. doi:10.1186/1471-2458-11-66.
27. Selmaoui B, Touitou Y. Association Between Mobile Phone Radiation Exposure and the Secretion of Melatonin and Cortisol, Two Markers of the Circadian System: A Review. Bioelectromagnetics. 2021;42(1):5-17. doi:10.1002/bem.22310.
28. Nasir GM, et al. Correlation of Smart Phone Addiction with Poor Sleep Quality and Low Academic Score in Medical Students of Nishtar Medical University, South Punjab. 2023.
29. Kwon M, Kim DJ, Cho H, Yang S. The Smartphone Addiction Scale: Development and Validation of a Short Version for Adolescents. PLoS ONE. 2013; 8(12).
30. Buysse DJ, Reynolds CF, Monk TH, et al. The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psychiatry Res. 1989;28(2):193-213. doi:10.1016/0165-1781(89)90047-4.
31. Naser AY, Alwafi H, Itani R, et al. Nomophobia among university students in five Arab countries in the Middle East: prevalence and risk factors. BMC Psychiatry. 2023;23(1):541. doi:10.1186/s12888-023-05049-4.
32. Li L, Chen IH, Mamun MA, et al. Nomophobia Questionnaire (NMP-Q) Across China, Bangladesh, Pakistan, and Iran: Confirmatory Factor Analysis, Measurement Invariance, and Network Analysis. Int J Ment Health Addict. Published online September 14, 2023. doi:10.1007/s11469-023-01154-3.
33. Latifi TT. Incidence of nomophobia and smartphone addiction among young physical therapists in Karachi. Pak J Rehabil. 2020;9(2):36-41. doi:10.36283/pjr.zu.9.2/008.
34. Ahmad M, Hussain M, Askari H, et al. Prevalence of nomophobia: mobile phone dependence among medical and dental students of Pakistan.
35. El-Ashry AM, El-Sayed MM, Elhay ESA, et al. Hooked on technology: examining the co-occurrence of nomophobia and impulsive sensation seeking among nursing students. BMC Nurs. 2024;23(1):18. doi:10.1186/s12912-023-01683-1.
36. Kwon M, Kim DJ, Cho H, Yang S. The Smartphone Addiction Scale: development and validation of a short version for adolescents. PLoS ONE. 2013;8 (12).
37. Buysse DJ, Reynolds CF, Monk TH, et al. The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research. Psychiatry Res. 1989;28(2):193-213. doi:10.1016/0165-1781(89)90047-4.
38. 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(2):85-92. doi:10.1556/2006.4.2015.010.
39. Lin YH, et al. Proposed diagnostic criteria for smartphone addiction. 2016.