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Smartphone Addiction Among Technical Institute Nursing Students: Nomophobia and Health

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Abstract:
Background: Smartphone addiction is a global widespread issue among young adults and it may have detrimental effects on their wellbeing. **Aim of the study** was to investigate smartphone addiction among technical institute nursing students: nomophobia and health. **Subjects & Methods: Design:** Descriptive design was used to conduct this study. **Setting:** The existing study was conducted in technical institute of nursing at Zagazig University. **Sample:** 360 students enrolled in the study. **Tools:** interview questionnaire, Smartphone Addiction Scale Short Version, Nomophobia Questionnaire, Neck Disability Index and Cornell Musculoskeletal Discomfort Questionnaire. **Results:** The results showed that 15% of Female Nursing Students with experienced of smartphone addiction compared with 13.33% among the male and more than half (58.06%) of the studied sample had moderate level of nomophobia. The highest mean score domain in the Neck Disability Index was headache (1.61±1.44), 37.50% of the studied sample had moderate musculoskeletal discomfort and 35% of them complained of blurred vision. Ultimately, there were statistically significant positive correlations between smartphone addiction, nomophobia, neck disability, musculoskeletal discomfort and eye problems. **Conclusion:** Smartphone addiction affects negatively on nomophobia and health. **Recommendation:** Nursing intervention program about hazards of smartphone addiction and its effects on health.

Keywords: Health, Nursing students, Nomophobia & Smartphone Addiction.

Introduction
Smartphones are regarded as crucial communication tools and are increasingly becoming an essential component of our societies since they serve as both a social supplement and a communication tool **(Ram, 2018).** It has played a major role in establishing and maintaining the social connectivity between the humans even from far distance through use of various applications such as Facebook, Twitter, Instagram, WhatsApp, and Gmail, so it has become one of the most important integral parts of human life including that of college students **(Ghogare et al., 2021).**

Information and communications technologies (ICT) were more widely used, researchers looked into a number of issues related to utilizing mobile phones (UMPs), including as smartphone addiction and nomophobia **(Mendoza, et al., 2018).** Smartphones have becoming a part of behavioral addiction, known as smartphone addiction, among the current generation of college students **(Tateno et al., 2019).**

The overuse of smartphones and the manifestation of an insatiable urge to use them when they are out of reach or sight are characteristics of smartphone addiction **(WHO, 2019).** It is pervasive and can be characterized as an incessant demand to use a phone despite potential negative effects on one's health and wellbeing **(D'souza & Sharma, 2020).** It is a significant issue that has a detrimental impact on academic performance and can cause social, psychological and physiological health problems such as headaches, eye dryness, earache, fatigue, in addition to musculoskeletal manifestations **(Periman & Sullivan., 2016; Güner & Demir, 2022).**

The condition known as "Nomophobia" has also been linked to excessive smartphone use. "Nomophobia" is an acronym for "no cell phone phobia", which is defined as "the apprehension of losing communication, connectivity, and information access, as well as the convenience that smartphones provide". The fear of not having access to a cell phone or the inability to control the worry of leaving the house without a cell phone are its definitions" **(Çobanoğlu et al., 2021; Sahoo & Kumari, 2022).** The prevalence of nomophobia varies from 6% to 73% across different populations. It is anticipated that this prevalence will rise and become a significant issue due to the widespread use of smartphones; adolescents and young adults, who are university students have a high prevalence of severe nomophobia **(Tuco et al., 2023).**

This kind of behavioral addiction is believed to have negative effects on both patient and employee safety in fields that deal with human health, such as nursing and medicine. Students studying medicine and

nursing, who devote a significant portion of their curriculum to clinical problems, are accountable for the safety of both patients and staff. The way students perform in clinical settings may be impacted by their overuse of smartphones. Because of this, it's critical to investigate smartphone addiction in healthcare students **(Celikkalp et al., 2020).**

Significance of the study:

Information and communication technology is now an essential aspect of peoples' daily life. Many individuals spend a lot of time using their electronic gadgets, especially teens. Smartphones are used for studying, searching for information on the internet, playing games or for communication and social networks **(Ayar et al., 2018).** In Egypt 2023, 96.97 % of the total populations have active cellular mobile connections and 71.89% in the total population are internet users with an average daily time of 7 hours and 41 minutes. Additionally, it is estimated that 60.9% of Egyptian aged 18 and above are active social media users **(Ministry of Communications and Information Technology, 2023).**

The excessive use of smartphone causes numerous issues include social media addiction and nomophobia, which negatively impact a person's physical, mental, social, academic, and professional lives **(Mahgoub et al., 2019).** Subsequently, discovering the prevalence of nomophobia among nursing students is very important, as the misuse of smartphones in clinical practice may cause distractions, affecting the quality of care and putting patient safety at risk **(Gutiérrez-Puertas et al., 2019).**

On the other hand, Teenagers' growing need for smartphones has led to a daily rise in smartphone usage and the health issues that come with it. This generation of student nurses is particularly affected by these issues. Knowing how adolescents use smartphones will assist to better understand the negative effects of this age group, particularly with regard to smartphone addiction and related health issues. This will help raise awareness and develop strategies to address these issues.

Aim of the study:

The current study aimed to investigate smartphone addiction among technical institute nursing students: nomophobia and health.

Research Questions:

1- What is the level of smartphone addiction risk among technical institute nursing students?
2- What is the degree of nomophobia among technical institute nursing students?
3- What are health problems associated with smartphone use?
4- Are there relations between smart phone addiction, nomophobia and health?

Subjects and Methods:

Design:

Descriptive design was used to investigate smartphone addiction among technical institute nursing students: nomophobia and health.

Setting:

The existing study was conducted in technical institute of nursing at Zagazig University, Egypt according to random selection of the study sample place.

Subjects:

Multistage random sampling technique comprised 360 nursing students according to the following predetermined criteria:

Inclusion criteria:

- Age: 17-22 years.
- Both genders.
- Subjects accept to participate in study.
- Subjects with minimum smart phone use ≥ one year and one hour per day.

Exclusion criteria:

- Students diagnosed with smart phone addiction.
- Students diagnosed with musculoskeletal trauma, neurological problems.
- Students undergoing vision correction surgery (LASIK).

Sampling technique:

Multistage random sampling technique was utilized include:

First stage:

Zagazig University consisted of theoretical and practical faculties, and then the practical faculties were chosen randomly.

Second stage:

Practical colleges include practical institutes, and a random selection was made for Technical Institute Nursing Students.

Third stage:

Random selection for three sections for first year students and three sections for second year students at the Nursing Institute and selection students according to inclusion criteria.

Sample size calculation:

Employing literature data from **Buctot et al., (2020),** to estimate the sample size with precision/absolute error of 5% and type 1 error of 5%. Sample size = $[(Z1-\alpha/2)^2.P\ (1-P)]/d^2$, where, Z1-α/2 at 5% type 1 error ($p<0.05$) is 1.96, P is the expected proportion in population based on previous studies and d is the absolute error or precision. Therefore, sample size = $[(1.96)^2.(0.626).(1-0.626)]/(0.05)^2=359.7$. Based on

the formula, the sample size required for the study is 360 students.

Tools for data collection:

Tool I: Interview Questionnaire composed of:

Part 1: Demographic data include questions about sex, age, residence, semester level, educational level and occupation for father and mother, marital status for parents and monthly income.

Part 2: Smart phone use include questions about presence of internet access, duration and frequency of mobile use, number of mobile applications, the most common used applications, and the purposes and places of smart phone use. These questions adapted from **Yildirim (2014).**

Part 3: Eye problems include questions which adopted from **Issa et al. (2021).** such as; Have you ever felt pain or dryness of the eye because you spend a lot of time on the smartphone?, Do you have eye problems when using smartphone?, How many times do you feel this problem after smartphone use?, How long have you finished your smartphone to cause the problem?, What are the vision problem do you feel? and Is the problem increased with the use of smartphone?

Tool II: Smartphone Addiction Scale Short Version (SAS-SV) modified from **Pasquale et al., (2017)** to identify the level of the smartphone addiction risk and distinguish the high-risk group in adolescent. It is a 6-point Likert-type scale comprises 10 items regarding daily-life disturbance, withdrawal, cyberspace-oriented relationship, overuse and tolerance.

Scoring system

Participants expressed their opinion for each item over a 6-point scale, ranging from 1 (strongly disagree) to 6 (strongly agree). A higher score corresponds to a higher risk of addiction. Total scores normally vary from 10 to 60. Males and females are shown to have distinct normal ranges. If a man's score is more than 31, he is deemed addicted. Scores between 22 and 31 indicate a high risk of addiction. Females who score between 22 and 33 are at high risk of addiction, and those who score higher than 33 are addicted. **(Kwon et al., 2013).**

Tool III: Nomophobia Questionnaire (NMP-Q): Yildirim and Correia (2015) particularly designed the validated NMP-Q questionnaire to assess college students' nomophobic behaviors. This self-administered 20-item quiz addresses the four main causes of nomophobia: namely (1) not being able to communicate, (2) losing connectedness, (3) not being able to access information, and (4) giving up convenience.

Scoring system

A 7-point Likert scale, with 1 denoting "strongly disagree" and 7 denoting "strongly agree," is used to score total items. The total score (ranging from 20 to 140) was used to classify the study participants into the absence of NMP (20 or less), mild level (21–59), moderate level (60–99), or severe level of NMP (100–140).

Tool IV: Neck Disability Index: The NDI is the most widely used and most strongly validated instrument to measure neck pain adapted from **Vernon & Mior (1991)** with 10 items Likert Scale ranging from 0 (no pain) to 5 (worst pain). The subdomains of NDI include pain, personal care, lifting, reading, headaches, concentration, work, mobility in transportation, sleeping and recreation.

Scoring system

Each section is scored on a 0 to 5 rating scale, in which zero means 'no pain' and 5 means 'worst imaginable pain'. The test was interpreted as a raw score, with a maximum score of 50. A higher NDI score indicates greater neck disability.

Tool V: Cornell Musculoskeletal Discomfort Questionnaire: The CMDQ is a 60 items questionnaire developed by **Hedge et al. (1999).** It contains a body map diagram and questions about (1) the prevalence of musculoskeletal pain (frequency); (2) discomfort; and (3) interference with work during the previous week in 20 regions of the body to assess musculoskeletal discomfort. Total discomfort score was calculated by using the following formula: frequency+ discomfort +interference, where higher the scores indicated more discomfort.

Scoring system

Discomfort was graded into three types: slightly, moderately and very uncomfortable with score of 1, 2, and 3 respectively. The interference with work was categorized into three groups: not at all, slightly, and substantially inference with score of 1, 2, and 3 respectively for the three groups. The weightage was given to the frequency score (Never=0, 1-2 times/week=1.5, 3-4 times/week=3.5, Once every day=5, several times every day=10). The discomfort or severity of discomfort score was calculated by multiplying the above frequency score (0, 1.5, 3.5, 5, 10) by the discomfort score (1, 2, & 3) by the interference score (1, 2, & 3). The range of total attainable score can be (0-35.50). The total CMDQ score was used to classify the study participants into no discomfort (score equal zero), mild discomfort (score $\leq$ 1.5), moderate discomfort (1.6–10.5) and severe discomfort (score >10.5).

Phase of preparation:

To become familiar with the research problem and create study instruments, a review of previous and current literature that is relevant to the investigation was conducted. Books, articles from periodicals, magazines, and the internet were used to gain

theoretical information about different parts of the study.

Content validity:

A panel of three community health nursing specialists from Zagazig University's faculties of medicine and nursing evaluated each study tool for content validity and gave recommendations for improvements. This process established the validity of the instruments.

Content reliability:

Test-retest reliability was estimated, and internal consistency was measured to evaluate the tools' dependability. The researcher assessed test-retest reliability by giving the identical instruments to the same people in comparable settings two or more times. Cronbach alpha coefficients were computed in order to evaluate the internal consistency of the instruments as the following:

Tools for Data Collection	No. of Items	Coefficient Alpha (Cronbach)
Tool I: ▪ Smartphone Addiction Scale–Short Version **(SAS-SV)**	10	0.876
Tool II: ▪ Nomophobia Questionnaire **(NMP-Q)**	20	0.910
Tool III: ▪ Neck Disability Index **(NDI)**	10	0.824
Tool IV: ▪ Cornell Musculoskeletal Discomfort Questionnaire **(MCDQ)**	60	0.845

Pilot study:

About 36 nursing students, or 10% of the study subjects, participated in the pilot study. The pilot study's objectives were to determine whether the questions were unclear and to evaluate the tools' viability and practicability. It also assisted the researchers in estimating the amount of time required to complete the forms. The primary study sample did not include any participants from the pilot trial.

Fieldwork:

After obtaining authorization to proceed with the study, the researchers started the collection of data through interview questionnaire, the average time 30-45 minutes to complete the interview questionnaires. Work continued 2 days per week; Monday and Thursday from 12 pm to 2 pm. Data were collected through 2 months, starting from March 2023 to the end of April 2023.

Ethical Considerations:

Ethical approval; this study was approved by the ethics committee of the Faculty of Nursing, Zagazig University, Egypt and the approval of participation was taken verbally after the study's goal has been fully explained. They were informed that they could withdraw at any moment and that any information collected on them would be kept private and used exclusively for research.

Administrative Design:

Formal approval was obtained through a letter from the Dean of nursing faculty, Zagazig University, explaining the objective of the study and demand cooperation from the director of Technical Institute of Nursing.

Statistical Design:

All data were collected, tabulated and statistically analyzed using IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp. Quantitative data were expressed as the mean ± standard deviation (SD), and qualitative data were expressed as number and percentage, as well as test statistical significance and associations between eye problems and smartphone addiction by using Chi-square test. Pearson Correlation analysis was used for assessment of the inter-relationships among various study variables. In order to identify the independent predictors of smartphone addiction and nomophobia, multiple linear regression analysis was done. Statistical significance is considered as highly statistically significant p - value< 0.01, significant p-value < 0.05 and statistically insignificant p-value ≥ 0.05. Additionally, Cronbach alpha coefficient was calculated to assess the reliability of the tool through their internal consistency.

Results:

Part (I): Smartphone addiction scores and prevalence of nomophobia among the study sample:

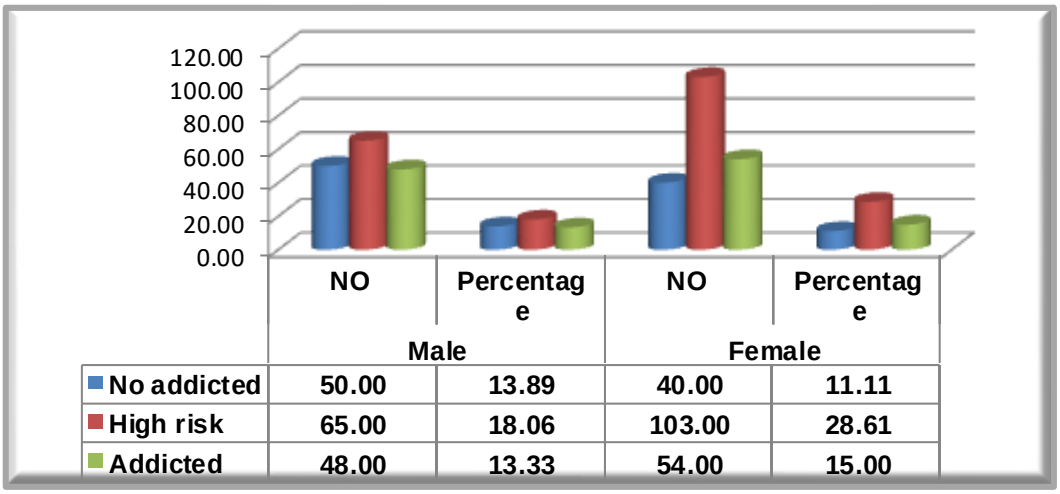

Figure (1): Smartphone addiction among the studied nursing students according to their gender (n = 360)

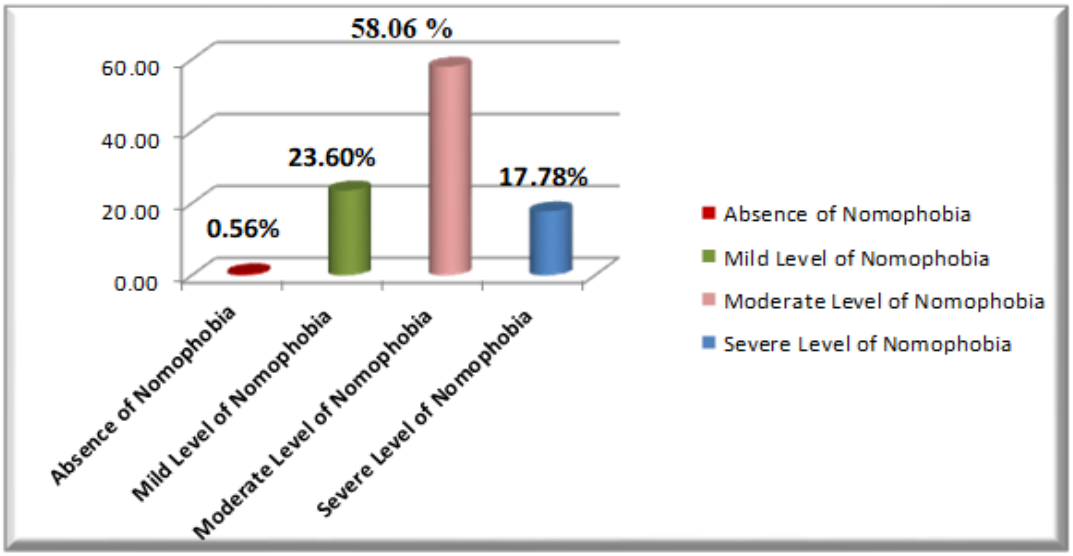

Figure (2): Prevalence of nomophobia among the studied nursing students (n = 360)

Part (II): Health problems associated with smartphone use among the study sample:

Table (1): Neck Disability Index (NDI) Scores among the studied nursing students (n = 360)

Domains of NDI	Mean	SD
Pain Intensity	0.79	1.03
Personal Care	0.21	0.70
Lifting	1.53	1.55
Reading	0.76	0.84
Headaches	1.61	1.44
Concentration	0.84	1.08
Work	0.60	0.99
Mobility in transportation	0.68	0.93
Sleeping	1.22	1.62
Recreation	0.52	0.93
Total	8.75	6.92

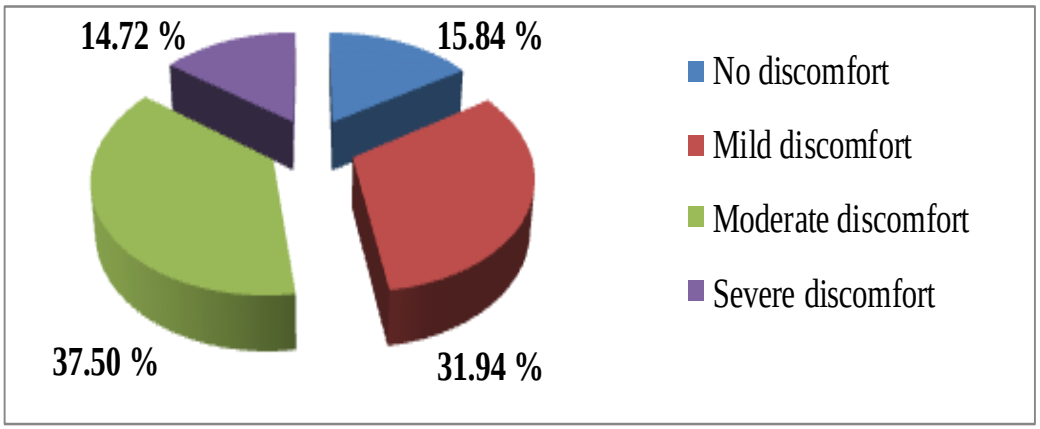

Figure (3): Prevalence of musculoskeletal discomfort among the studied nursing students (n = 360)

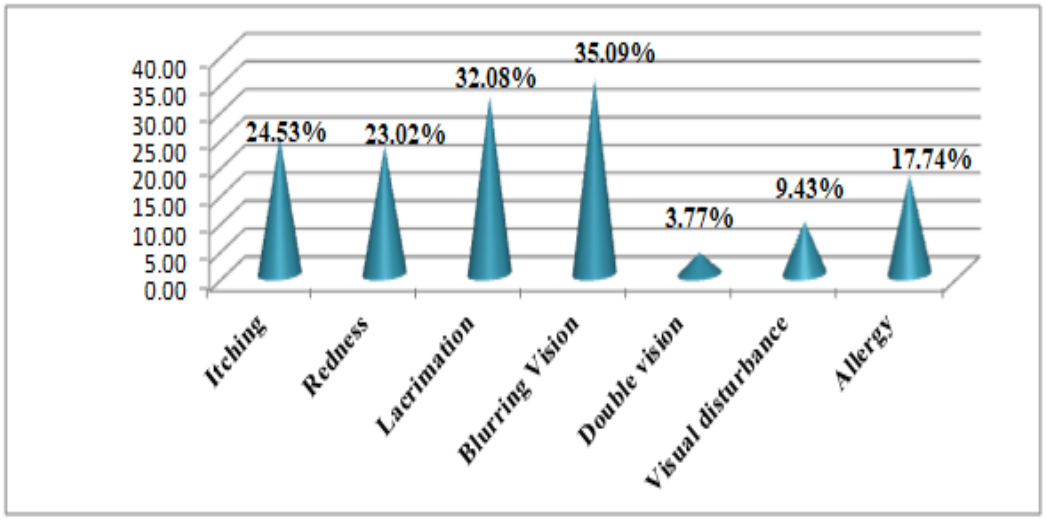

Figure (4): Ocular symptoms during smartphone use (n = 265) (Multi Response)

Part (III): Correlations and predictors of the studied variables among the study group:

Table (2): Correlation analysis between the SAS-SV and the NMP-Q (n = 360)

Variables	NMP-Q Subscale Scores			
	Not being able to communicate	Losing connectedness	Not being able to access information	Giving up convenience
SAS-SV Subscale				
Daily life disturbance	0.280**	0.299**	0.248**	0.314**
withdrawal	0.337**	0.594**	0.369**	0.504**
Cyberspace-oriented relationship	0.304**	0.351**	0.306**	0.326**
Overuse	0.113*	0.199**	0.216**	0.322**
Tolerance	0.212**	0.288**	0.228**	0.341**
Total	0.378**	0.551**	0.403**	0.535**

Abbreviations: *SAS-SV, Smartphone Addiction Scale–Short Version; NMP-Q, Nomophobia Questionnaire.*
**significant p<0.05. ** highly significant p< 0.01.*

Table (3): Correlation analysis between the SAS-SV, NDI, and CMDQ

Variables	NDI Subscale Scores										MCDQ Subscale Scores		
	Pain intensity	Personal care	Lifting	Reading	Headache	Concentration	Work	Transportation mobility	Sleeping	Recreation	Frequency	Discomfort	Interference
SAS-SV Subscale													
Daily life disturbance	0.309**	0.171**	0.172**	0.245**	0.218**	0.282**	0.280**	0.189**	0.162**	0.230**	0.207**	0.243**	0.262**
withdrawal	0.213**	0.187**	0.120*	0.136*	0.269**	0.260**	0.222**	0.141*	0.267**	0.138*	0.138*	0.189**	0.218**
Cyberspace-oriented relationship	0.122*	0.051	0.117*	0.071	0.144*	0.158**	0.089	0.044	0.064**	-0.002	0.031	0.054	0.069
Overuse	0.172**	0.128*	0.058	0.243**	0.198**	0.175**	0.138*	0.113*	0.274**	0.008	0.012	0.053	0.059
Tolerance	0.187**	0.131*	0.098	0.097	0.256**	0.252**	0.231**	0.181**	0.222**	0.064	0.005	0.063	0.064
Total	0.300**	0.208**	0.169**	0.225**	0.316**	0.331**	0.291**	0.197**	0.288**	0.164**	0.152**	0.211**	0.236**

Abbreviations: *NDI, Neck Disability Index; MCDQ, Cornell Musculoskeletal Discomfort Questionnaire.*
*non-significant p>0.05 **significant p<0.05 ** highly significant p< 0.01.*

Table (4): Correlation analysis between the SAS-SV, NMP-Q, NDI, and CMDQ (n = 360)

	SAS	NMP-Q	NDI	CMDQ
SAS	1.00			
NMP-Q	0.683**	1.00		
NDI	0.510**	0.399*	1.00	
CMDQ	0.450**	0.320**	0.430**	1.00

Note: *p < 0.05 **p < 0.01

Table (5): Relation between eye problems and smart phone addiction for male & female nursing students (N=360)

Variables	Male Smartphone Addiction (N=163)						X^2	p- value	Female Smartphone Addiction (N=197)						X^2	p- value
	SAS 1 (50)		SAS 2 (65)		SAS 3 (48)				SAS 1 (40)		SAS 2 (103)		SAS 3 (54)			
	No	%	No	%	No	%			No	%	No	%	No	%		
Have you ever felt pain or dryness of the eye because you spend a lot of time on the smartphone?																
No	16	32	15	23	22	46	7.322	0.053	15	38	25	24	7	13	13.77	0.005**
Yes, rarely	6	12	12	18	9	19			7	18	17	17	5	9		
Yes, sometimes	27	54	36	55	11	23			17	43	46	45	35	65		
Yes, daily	1	2	2	3	6	13			1	3	15	15	7	13		
Do you suffer from eye problems when using smartphone?																
Yes	25	50	46	71	40	83	7.45	0.008**	22	55	84	82	48	89	60.35	0.001**
No	25	50	19	29	8	17			18	45	19	18	6	11		

Variables	Male Smartphone Addiction (N=163)						X^2	p- value	Female Smartphone Addiction (N=197)						X^2	p- value
	SAS 1 (50)		SAS 2 (65)		SAS 3 (48)				SAS 1 (40)		SAS 2 (103)		SAS 3 (54)			
	No	%	No	%	No	%			No	%	No	%	No	%		
If yes, What ocular symptoms do you have when using smartphone?																
Itching	6	12	13	20	9	19	13.59	0.032*	2	5	18	17	17	31	26.66	0.002**
Redness	10	20	8	12	9	19			4	10	15	15	15	28		
Lacrimation	3	6	13	20	14	29			3	8	34	33	18	33		
Blurring Vision	6	12	18	28	13	27			9	23	35	34	12	22		
Double vision	2	4	-	-	6	13			-	-	2	2	-	-		
Visual disturbance	1	2	1	2	4	8			4	10	12	12	3	6		
Allergy	4	8	8	12	2	4			3	8	22	21	8	15		
How many times do you feel this problem after smartphone use?																
Rarely	14	28	25	38	16	33	2.737	0.228	7	18	20	19	6	11	25.927	0.001**
Sometimes	10	20	15	23	17	35			13	33	40	39	32	59		
Much	1	2	5	8	3	6			1	3	16	16	9	17		
Always	-	-	1	2	5	10			1	3	8	8	1	2		
How long have you finished your smartphone to cause the problem?																
Directly	18	36	33	51	17	35	2.673	0.261	17	43	53	51	19	35	10.106	0.145
After half an hour	6	12	4	6	7	15			2	5	13	13	15	28		
Half to one hour	1	2	1	2	4	8			1	3	3	3	4.	7		
One-two hours	1	2	7	11	7	15			1	3	6	6	5	9		
2-4 hours	-	-	1	2	2	4			1	3	4	4	3	6		
≥6 hours	-	-	-	-	4	8			-	-	4	4	2	4		
What are the vision problem do you feel?																
Myobe	4.00	8	4	6	8	17	2.987	0.423	6	15	15	15	11	20	6.237	0.12
Hypermetrobe	3.00	6	-	-	4	8			1	3	7	7	4	7		
Astegmatism	1.00	2	2	3	3	6			-	-	4	4	-	-		
Don't Know	19.0	38	41	63	26	54			16	40	58	56	33	61		
Is the problem increased with the use of smartphone?																
Yes	10	20	21	32	22	46	3.59	0.21	13	33	54	52	32	59	18.405	0.001**
No	17	34	26	40	19	40			10	25	30	29	16	30		

Abbreviations: *SAS 1, No Addicted; SAS 2, High Risk; SAS 3, Addicted* χ^2 ***= Chi square test non-significant p>0.05***

****significant p<0.05*** ***** significant p< 0.01***

Table (6): Multiple regression analysis for SAS-SV score (n = 360)

Independent Variables	Unstandardized Coefficients		Standardized Coefficients Beta β	t test	P Value
	B	Std. Error SD			
Constant	18.308	4.805		3.810	.000
Age	.667	.733	.057	.911	.363
Gender	.627	.915	.034	.685	.494
Residence	-.248	1.067	-.012	-.233	.816
Semester Level	1.121	1.162	.062	.965	.335
Father's Education	.877	.911	.062	.963	.336
Father's Occupation	-.334	.339	-.051	-.985	.325
Mother's Education	-.532	1.031	-.034	-.516	.606
Mother's Occupation	.290	1.094	.015	.265	.791
Family Status	-.886	.870	-.050	-1.019	.309
Family income	1.046	.829	.066	1.262	.208
Net Package	-2.635	1.011	-.137	-2.606	.010
Number of years using smart phone	.033	.572	.003	.058	.954
Number of hours using smartphone/day	1.573	.490	.172	3.212	.001
Number of applications on smart phone	.043	.029	.075	1.486	.138
Self-evaluation of smartphone addiction	2.740	.532	.260	5.151	.000

Note: *R Square= 0.187, Adjusted R Square = 0.151, F = 5.266, significant p<0.05.*

Table (7): Multiple regression analysis of predictors of NMP-Q (n = 360)

Independent Variables	Unstandardized Coefficients		Standardized Coefficients Beta β	t test	P Value
	B	Std. Error SD			
Constant	40.153	12.472		3.220	.001
Age	-1.122	1.902	-.038	-.590	.556
Gender	4.454	2.375	.096	1.875	.062
Residence	-1.226	2.770	-.023	-.443	.658
Semester Level	5.154	3.015	.112	1.710	.088
Father's Education	-.458	2.366	-.013	-.194	.847
Father's Occupation	.352	.879	.021	.400	.689
Mother's Education	4.204	2.676	.108	1.571	.117
Mother's Occupation	3.195	2.841	.064	1.125	.261
Family Status	-2.291	2.258	-.051	-1.015	.311
Family income	1.724	2.153	.043	.801	.424
Net Package	-3.743	2.624	-.077	-1.427	.155
Number of years using smart phone	1.717	1.484	.063	1.157	.248
Number of hours using smartphone/day	4.302	1.271	.186	3.383	.001
Number of applications on smart phone	.071	.075	.049	.948	.344
Self-evaluation of smartphone addiction	3.414	1.381	.128	2.473	.014

Note: R Square= 0.142, Adjusted R Square = 0.105, F = 3.799, significant p<0.05.

Table 8: Multiple regression analysis of the effect on SAS of NMP-Q, NDI, and CMDQ (n = 360)

Dependent Variable	Independent Variable	β	t	p	R2	Adj. R2	F
	Constant		7.349	.000*	.419	.415	85.736
SAS	**NMP-Q**	.515	12.223	.000*			
	NDI	.324	7.000	.000*			
	CMDQ	.132	2.928	.004*			

***Note:** *p < 0.01.*

Study results show that 47.2 % of the studied nursing students were aged 19 to less than 20 years old, 54.7% of them were females and 81.9% of them were from rural areas. Nursing students in the first year related to educational level represented 54.2% of the studied sample. It was also found that 56.9% and 65.3% of the studied nursing students' fathers and mothers respectively had intermediate education.

Regarding smartphone addiction scores, **Figure (1):** demonstrates that female nursing students experienced higher levels of smartphone addiction than male, where 28.61% of female nursing students were at high risk for addiction compared to 18.06% of male nursing students. Additionally, 15% of female nursing students were addicted versus to 13.33% male nursing students.

Concerning prevalence of nomophobia, **Figure (2):** illustrates that 58.06% of the studied sample had moderate level of nomophobia. Moreover, 17.18% of them had severe level of nomophobia.

As regards neck disability index**, Table (1):** Reveals that the highest mean score domain among the studied sample was headaches (1.61±1.44) followed by pain during lifting heavy weights (1.53± 1.55), while the lowest mean score were personal care and reading (0.21±0.70, 0.76±0.84) respectively.

In terms of prevalence of musculoskeletal discomfort, **Figure (3):** Shows that 37.50% of the studied sample had moderate musculoskeletal discomfort and 14.72% of them had severe musculoskeletal discomfort.

With regard to ocular symptoms during smartphone use, **Figure (4):** Displays that the most common ocular symptoms among the nursing students who suffering from eye problems when using smartphone were blurring vision (35.09%) followed by lacrimation (32.08%).

Table (2): Indicates that positive associations that were statistically significant were found between each of the nomophobia's sub-dimensions, including not being able to communicate, losing connectedness, not being able to access information, giving up convenience and all sub-dimensions of smartphone addiction scale, including "daily-life disturbance", "withdrawal", "cyberspace-oriented relationship", "overuse" and "tolerance" at $p < 0.01$.

According to Table (3): There were statistically significant positive correlations between total SAS-SV and NDI subscale at $p < 0.01$. As well, the total SAS-SV was found to have statistically significant positive correlations with frequency ($r = 0.152$), discomfort ($r = 0.211$) and interference ($r = 0.236$), at $p < 0.01$.

Table (4): Points to a highly statistically significant positive correlation between smartphone addiction and nomophobia ($p < 0.01$; $r = 0.683$); between smartphone addiction, neck disability and musculoskeletal discomfort, were statistically significant positive ($r = 0.510$; $r = 0.450$) respectively at $p < 0.01$. Moreover, statistically significant positive correlations were found between nomophobia, neck disability and musculoskeletal discomfort. Additionally, a statistically significant positive correlation was found between neck disability and musculoskeletal discomfort.

Table (5): Indicates highly statistically significant relation between smartphone addiction among both male and female nursing students and experiencing eye problems when using smartphone at $p<0.01$. In addition to, statistically significant relation between female smartphone addiction and eye dryness ($\chi^2 = 13.77$, $p=0.005$), where 65% of the female nursing students described the frequency of eye dryness as "sometimes yes". Furthermore, blurring vision and lacrimation were the most ocular symptoms experienced while using smartphones with highly statistically significant relation with female smartphone addiction at $p<0.01$ ($\chi^2 = 26.66$) and statistically significant relation with male smartphone addiction at $p<0.05$ ($\chi^2 = 13.59$). Additionally, there were statistically significant relations between female smartphone addiction, frequency of ocular symptoms and increasing intensity of visual problems at $p=0.001$.

Table (6): Presents the best fitting linear regression model for smartphone addiction score. It indicates that average hours the studied sample spent on their smartphone per day and their self-evaluation of smartphone addiction were statistically independent positive predictors of smartphone addiction. On the other hand, **Net Package was** statistically independent negative predictor of smart phone addiction. The regression model explains 18.7% variation in smart phone addiction score as indicated by r square value.

Table (7): Illustrates the best fitting linear regression model for nomophobia score. It indicates that average hours the studied sample spent on their smartphone per day and their self-evaluation of smartphone addiction were statistically independent positive predictors of nomophobia score. The regression model explains 14.2% variation in nomophobia score as indicated by r square value.

Table (8): Explains the effect of smartphone addiction on nomophobia, neck disability and musculoskeletal discomfort. It indicates that nomophobia, neck disability and musculoskeletal discomfort were statistically independent positive predictors of smart phone addiction score. The regression model explains 41.9% variation in smartphone addiction score as indicated by r square value.

Discussion:

In the last several decades, smartphones have significantly transformed our lives and as time has gone on, their use has grown exponentially. College students are increasingly utilizing smartphones which have become essential for meeting their demanding needs. Smartphones have many features such as camera, games, media players, GPS navigation, a plethora of applications, and the internet in addition to being a source of communication, information, entertainment, and personal assistant **(Alkhateeb et al., 2020).**

Concerning the first research question about smartphone addiction score, the current study results revealed that the female nursing students experienced higher levels of smartphone addiction than male. Similarly, in Ireland, a study done by **Boland & Kelly (2021)** found that females displayed significantly higher addictive smartphone behaviors (M = 108.14) than males (M = 75.61). Additionally, in Karachi, Pakistan, it was observed that females were using WhatsApp more than their male counterparts **(Tariq et al., 2019).** This result might be explained for the reason that females appear to be more prone to emotional imbalance, so they use smartphones to redress this imbalance. Furthermore, there exist variations in the objectives behind smartphone use by gender. According to studies, men use their smartphones for more diverting purposes, such as playing games and watching movies, but women are more likely to use them for social networking and communication purposes that are important to them **(Chen et al., 2017).**

In contrast, **Alhazmi et al. (2018)** implemented a study in Jeddah and found that smartphones addiction is higher among males than females. This difference may be related to the discrepancies in cultures and societal norms between Egypt and Saudi Arabia.

Regarding the second research question about nomophobia level, the present study illustrated that more than half of the studied sample had moderate level of nomophobia. Moreover, less than one fifth of them had severe level of nomophobia. This finding was in the same line with a study conducted in Lima, Peru by **Tuco et al. (2023)** who found that the prevalence of moderate nomophobia was 56% and that of severe nomophobia was 17%. Moreover, in Saudi Arabia, this finding was supported by **Aldhahir et al. (2023)** who stated that the mean of the total NMP-Q items scores was 62 indicating a moderate level of nomophobia among the students. From the researchers' point of view, this reflected the fact that nursing students have moderate emotional stability and conscientiousness personality traits' scores.

Conversely, **Buctot et al. (2020)** in Philippines indicated that 99.5% participating Filipino adolescents were nomophobic with more than two thirds of them had moderate level of nomophobia. This difference might be reflected the high prevalence of smartphone addiction in that study and the dissimilarity in the sample size.

With reference to the third research question about health problems of smartphone use, the existing study results clarified that the highest mean score domain in the neck disability index among the studied sample was headaches. In the same context, in Saudi Arabia, **Alabdulkarim et al. (2022)** found that headache was the most significant neck disability index indicator in the study participants. From the researchers' point of view, this result might be due to the longer use of smartphone associated with the neck flexion posture which affects the nervous system and leads to headaches.

Also, considering eye problems when using smartphone, the study results found that more than one third of the study sample complained of blurred vision. Likewise, similar findings have been noticed in Hingkong by **Chu et al. (2023)** who reported that the most commonly symptom was blurred vision (38.9%). From the researchers' point of view, this result might be attributed to the risks of smartphone use on ocular health including blurred vision.

In disagreement with this, **Issa et al. (2021)** in Saudi Arabia detected that most common ocular manifestation accompanying smartphone use was eye redness. Possible explanation of such result is that ocular symptoms varies from one person to another.

In addition to, concerning prevalence of musculoskeletal discomfort, the study results demonstrated that more than one third of study sample (37.50%) had moderate musculoskeletal discomfort. This finding was in consistence with **Hendi et al. (2021)** in Saudi Arabia who detected that musculoskeletal disorders are common health

problems reported by more than half of medical students. From the researchers' point of view, this result might be credited to the fact that smartphone use has risks on musculoskeletal system in which the user's repetitive static motion lowers blood flow, stops muscles from receiving nutrients, and produces mild discomfort and exhaustion. The minimum muscle strain that results from prolonged phone use and repetitive actions are the main causes of musculoskeletal diseases.

On the contrary, a study done by **Gumasing & Quimio (2023**) in Philippines found that sever discomfort occurred mainly with frequency of 97% followed by moderate discomfort 2.60%. The discrepancy between results might be due to the dissimilarity in the study institutions and the diversity in the specialty of the study samples.

As regards the fourth research question about correlations between smartphone addiction, nomophobia and health, the findings of the current study concluded that there were highly statistically significant positive correlations between sub-dimensions of nomophobia including "not being able to communicate", "losing connectedness", "not being able to access information" and "giving up convenience" and sub-dimensions of SAS-SV, including "daily-life disturbance", "withdrawal", "cyberspace-oriented relationship", "overuse" and "tolerance. This was supported by **Ciacchini et al. (2023) & Marengo et al. (2021)** in Italy who elucidated that smartphone is the most important social media tool which perceived as safe places for adolescents to express themselves freely, but makes them susceptible to addictive behavior, social isolation, low self-esteem, and thus leading to nomophobia.

This result was corresponded to **Çobanoğlu et al. (2021)** in Turkey who found that NMP-Q have a positive correlation with total SAS-SV, inability to access information, giving up convenience, inability to communicate and losing connectivity. Similarly, in Istanbul **Aydin & Kuş (2023)** indicated that the results of the correlation analysis revealed that nomophobia was positively associated with smartphone addiction. Additionally, in Brazil**,** Pearson's correlations indicated positive associations for the nomophobia factors with the smartphone addiction score **(Guimarães et al., 2022).** From the researchers' point of view smartphone addiction could also lead to nomophobia due to uncontrollable excessive smartphone use that when the smartphone is away, a feeling of fear or anxiety takes over.

In terms of correlation between smartphone addiction, neck disability and musculoskeletal discomfort, the concurrent study illustrated that there were highly statistically significant positive correlations between total smartphone addiction and neck disability.

This finding was corroborated by **Guloglu & Yalcin (2021)** who carried out study in Turkey and confirmed that there was a significant positive correlation between SAS and NDI scores. As well, **Pawar et al. (2022)** in India denoted that there was a positive correlation between neck disability and smartphone addiction in young smartphone users. From the researchers' point of view, this finding could be due to the known fact that the longer smartphone addiction period, the more neck disability severity, where in persistent, repetitive, and continuous head and neck movements towards the screen during the day might result from using cellphones excessively. There is a significant chance of chronic neck pain when making certain actions.

These results were contradicted with **Selvaganapathy et al. (2017)** in Malaysia concluded that smartphone addiction has no effect on craniovertebral angle. This might be ascribable to the difference in the tool or questionnaire form used in the study.

Additionally, the total SAS-SV was found to have highly statistically significant positive correlations with musculoskeletal discomfort. This finding was in accordance with **Rizk (2020)** in Saudi Arabia who emphasized that smartphone addiction correlated positively with musculoskeletal problems in the shoulder, neck and hands predominantly the thumb among university students. As well, a study done by **Ahmed et al. (2022)** among Bangladeshi and Indian college students indicated that smartphone addiction positively correlated with musculoskeletal pain in neck, shoulder, elbow and hands. On the same way, **Chovatiya et al. (2021)** in India pointed out that Pearson's correlation coefficient showed a significant positive correlation between SAS and Cornell musculoskeletal discomfort questionnaire (CMDQ) among college students. From the researchers' point of view, this reflected the fact that the longer smart phone addiction period, the more musculoskeletal discomfort in which poor postures lead to negative effects such as reduced physiological function, disruption of the autonomy nervous system, creation of problems in daily life and effects on the musculoskeletal system.

In the light of the current study, highly statistically significant positive correlations were found between nomophobia, neck disability and musculoskeletal discomfort. This finding was in agreement with **Gudegowda et al. (2023)** in Bengaluru urban district who detected that there was positive correlation between NMP-Q and neck disability index. Also, in India a study done by **Marbaniang et al., (2022)** found that Pearson's correlation coefficient shows a very significant positive correlation between

Nomophobia scores and Cornell hand discomfort scores. From the researchers' point of view, the rational of these phenomena might be related to the common physical consequences of nomophobia such as headaches, stomach aches, eye discomfort due to overexposure to the screen, or wrist and neck pain due to improper positioning.

On the other hand, the study results revealed that highly statistically significant moderately positive correlation was found between neck disability and musculoskeletal discomfort. At the same instance, **Anand et al. (2021)** in India revealed that there was slightly positive association between neck disability and upper extremity musculoskeletal discomfort. From the researchers' point of view, a possible rationale for this finding might be attributed to prolonged postures; high physical demands on the body, repetitive movements, and poor ergonomic design which are frequently linked to complaints of pain and discomfort that affect not only the neck but also upper limb regions such as the shoulder, arm, thumb, and fingers.

Concerning relation between smartphone addiction and eye problems, the study results revealed that there were statistically significant relations between smartphone addiction and eye problems. In the same vein, **Akib et al. (2021)** in Makassar indicated that there was a significant association between the prolonged use of smartphone and dry eye incidence. Moreover, the prolonged use of smartphone promotes various eye disorders. From the researchers' point of view, this reflects the fact that increased screen exposure time associated with smartphone addiction has negative effects on the visual systems leading to eye problems and headaches.

Based on the study findings, there were statistically significant relations between smartphone addictions, frequency of ocular symptoms. Similarly, study done by **Issa et al. (2021)** in Saudi Arabia concluded that there was an association between smartphone use and occurrence of ocular manifestations**.** From the researchers' point of view, the reason behind may be due to the fact that the longer smartphone addiction period, the more frequency of ocular symptoms.

Regarding multiple regression models for predictors of smartphone addiction, the current study results indicated that averag**e** hours the studied sample spent on their smartphone per day was statistically independent positive predictors of smartphone addiction. Similarly, **Mustafaoglu et al. (2021)** in Turkey found that excessive phone use is an indicator of high smartphone addiction scores. Also in Egypt, in Assiut University**, Abd-Elnaser et al. (2020)** found that the significant independent predictors of smartphone addiction are spending more than four hours daily on smartphone. From the researchers' point of view, this could be attributed for the reason that students may be battling a concept known as "Tolerance" if they spend hours on their cell phone.

Furthermore, the concurrent study illustrated that the self-evaluation of smartphone addiction was statistically independent positive predictor of smartphone addiction. Similarly, in Egypt, in Assiut University, **Abd-Elnaser et al. (2020)** found that the significant independent predictor of smartphone addiction is self-reporting as smartphones addict. From the researchers' point of view, such results reflected the effect of being aware of the self-smartphone addiction's level.

On the other extreme, net package was statistically independent negative predictor of smartphone addiction. Similarly, **Cha & Seo (2018)** in Korea who reported that the predictive factor of smartphone addiction was social networking service use duration. From the researchers' point of view, the explanation of this result might be due to as networking service is unavailable, the smartphone addiction decrease.

Moreover, the study results indicated that nomophobia, neck disability and musculoskeletal discomfort were statistically independent positive predictors of smartphone addiction score. This finding was consistent with **Awofala (2020)** in Nigeria who reported that nomophobia was a significant predictor of smartphone addiction. As well, a study done by **Mustafaoglu et al. (2021)** in Turkey concluded that smartphone addiction was statistically independent positive predictor with musculoskeletal pain in body parts. Moreover, addiction to smartphone use was associated with neck pain and disability in healthy young adults in turkey **(Guloglu, Yalcin, 2021).** From the researchers' point of view, this reflected the fact that nomophobia resulting in smartphone addiction that leads to neck disability and musculoskeletal discomfort.

Regarding multiple regression models for predictors of nomophobia, the present study results revealed that average hours the studied sample spent on their smartphone per day was statistically independent positive predictors of nomophobia. This finding was supported by **Gonçalves, et al. (2020**) In **USA** who found that the number of hours of smartphone use per day were identified as strong predictors of nomophobia**.** As well, in Saudi Arabia, **Al-shaikh et al (2019)** found that percentages of students with severe nomophobia were significantly higher among those who spend more than 2 hours daily with their mobile phones. From the researchers' point of view, the rational of these results might be due their greater dependence on their smart phones resulting in nomophobia.

On the other hand, their self-evaluation of smartphone addiction was statistically independent positive predictors of nomophobia. On the contrary, **Afifah & Wijayi (2022)** who found that negative correlation between self-control and nomophobia in Indonesia. From the researchers' point of view, this reflected the fact that aware of being smartphone addictive resulting in nomophobia.

Lastly, university students used their smartphones more frequently due to their vast range of applications, which had a detrimental effect on their health **(Okela, 2023).** In order to prevent the harmful effects of prolonged smartphone use, attention should be focused on safe technology use, raising public awareness of the risks associated with excessive smartphone use, and offering advice on the significance of small lifestyle changes like proper posture when using a smartphone, ergonomics, and taking breaks for at least 20 minutes.

Conclusion:

Female nursing students experienced higher levels of smartphone addiction than male and more than half of the studied sample had moderate level of nomophobia. In Neck disability index, the highest mean score domain was headaches (1.61±1.44) and more than one third of them had moderate musculoskeletal discomfort. Also, more than one third of them complained of blurred vision and statistically significant positive correlations were found between smartphone addiction, nomophobia and neck disability index, musculoskeletal discomfort and eye problems.

Recommendations:

1- Nursing intervention program about hazards of smartphone addiction and its effects on health.
2- Nursing intervention program about smartphone addiction's effects on psychological status including nomophobia.
3- Further research should be geared towards implementing health education programs about hazards of smartphone addiction and its effects on nomophobia and health of all technical institute nursing students in Egypt to assure study results.

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