

Correlation of nomophobia with texting thumb and cell-phone elbow among young adults who use smartphones

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Abstract:

Background: Use of smartphone has increased as compared to the past decade. Smartphones have become very important communicative devices used by people of all age groups today, especially young generation. They are widely used and are becoming very important in people's everyday life. The impact of smartphones may be both good and bad. They are useful in almost all areas of life such as communication, in business, health, education and social life. But it has also caused various health hazards such as pain in thumb/ wrist which causes repetitive injuries due to usage of smartphones for a long duration. Smartphones are now easily available with features that have been improved and they are now available in affordable prices.

This study assesses the level of nomophobia and correlate its use with disorders of the hand and elbow of young adults. The results shows that disorders such as texting thumb and cell-phone elbow are seen in students who are nomophobic. These injuries/disorders initially may be acute and short-term but may cause more serious problems in the long run which may affect the activities of daily living.

Materials and Methods: In this cross-sectional study, 50 students of Garden City University, both male and female belonging to age group 18-24 years took part in the survey study with a questionnaire. The questionnaire consists of 4 parts which included Demographic data, NMPQ to measure self-reported addiction to smartphone use, CHDQ for any pain and discomfort of the hand and interference with work and PRUNE to measure pain and disabilities of daily activities.

Results: There was a predominance of females over males (female- 27, males-23). Out of the total study population, 52% were below the age of 20 years, 48% were above 21 years. Mean±SD of NMPQ, CHDQ and PRUNE was 118.92±11.21, 41.96±15.54 and 34.85±10.23. Pearson's correlation coefficient shows a very significant positive correlation between Nomophobia scores and Cornell hand discomfort scores ($r=0.6381$, $p<0.05$), and the correlation between Nomophobia scores and Patient-rated ulnar nerve ($r=0.6577$, $p<0.05$) also showed positive result.

Conclusion: The results showed that texting thumb and cell-phone elbow are seen in nomophobic students. These injuries/disorders initially may be acute and short-term but may cause more serious problems in the long run which may affect the activities of daily living.

Key Word: Mobile phone addiction, Smartphones, Young generation, Text message injury, SMS syndrome

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I. INTRODUCTION

A smartphone is a gadget which is commonly used nowadays in all age groups from children to elderly. It can be used by individuals in both a consumer and a business context and are now almost integral to everyday modern life. Many consumers use their smartphones to engage on friends, family and brands on social media. The physical exposure while using smartphone especially during texting continuously requires repetitive thumb movements. There have been reports from previous studies about the increase in smartphone users which have caused significant increase in musculoskeletal disorders relating to smartphone use and also some behavioural effects.

A study which was conducted by Sharan et al.⁵ concluded that repetitive and prolonged use of smartphones could lead to disorders of the musculoskeletal system of the upper extremities. Another study which was conducted by Ahmed et al.¹⁷ reported musculoskeletal problems in the thumb, wrist, elbow, shoulder and neck in smartphone users who were students (54%).

The thumb muscles are used extensively during texting and playing games in smartphones. Repetitive movements and sustained gripping due to smartphone use leads to various musculoskeletal disorders in the upper extremity. During texting, the thumb is adducted and forceful movements are being applied on the thumb. There are studies which have reported disorders such as tendonitis in muscles such as adductor pollicis, extensor pollicis longus, tendonitis of the wrist and dequervain's syndrome are all associated with texting. Sharan and Ajeesh, et al.⁴ concluded that long duration use of mobile-phones could adversely affect the musculoskeletal system of the hand.

There are various factors which can lead to the condition known as SMS thumb or texting thumb. Factors such as thumb posture, size and weight of the smartphones, small spacing of the keyboard, etc. Texting on a smartphone for a long duration can be harmful for the posture of the body and overuse of the hand muscles may lead to pain, discomfort and disabilities of various parts of the body such as neck, forearm, hand and upper back muscles (Shah and Sheth, et al.)¹⁵

Texting thumb have been reported due to excessive use of the thumb and it is caused due to chronic overuse of these muscles which is seen when text messaging on phones. Repetitive gripping, pinching and grasping action could cause the tendons and tendon sheaths to become inflamed and cause limitation of movements of the tendons. SMS thumb/ Texting thumb is a stress injury which is caused due to repetitive movements of the thumb during texting and this can be prevented by maintaining proper posture during texting and taking preventive measures by controlling the usage of smartphones only for a short period of time.

Cell-phone elbow (Cubital Tunnel Syndrome) is the compression of the ulnar nerve due to excessive use of cell-phones. It causes pain, burning, aching, numbness and tingling-like symptoms on the forearm and hand. It is caused by repetitive movements, prolonged bending and elbow flexed constantly while using a cell-phone.

II. MATERIALS AND METHODS

Participants were recruited from physiotherapy students at Garden City University, Bangalore. To be included in the study are students, both male and female, among the age group 18-24 years with smartphone use of >5 hours per day. Exclusion criteria were students with arm and hand deformities/ contracture, past history of wrist and elbow injuries and those who had surgeries of the arm/ hand. In addition, students with complications associated with another disease that affects the wrist and elbow were also excluded. It is a cross-sectional study design with total sample of 50 subjects. The nature and purpose of this study was explained to the participants and informed consent was taken from them. Convenient sampling method was used to recruit the required sample size. Data was collected from November 2021 to March 2022. The questionnaire consists of 4 parts which included 1) Demographic data such as Name, Age, Gender and Hours of smartphone use. 2) Nomophobia Questionnaire to measure self-reported addiction to smartphone use. 3) Cornell Hand Discomfort Questionnaire for any pain and discomfort of the hand and interference with work 4) Patient-Rated Ulnar Nerve Evaluation to measure pain and disabilities of daily activities.

Study Design: Cross-sectional observational study.

Study Location: This study was done in physiotherapy students at Garden City University, Bangalore, Karnataka.

Study Duration: December 2021 to March 2022.

Sample size: 50 students.

Sample size calculation: The sample size calculation was done using the average mean.

Subjects & selection method: The study population was drawn from physiotherapy students of Garden City University who used smartphones for more than 5 hours per day. This study was done from December 2021 to March 2022.

Inclusion criteria:

- Age-18-24 years
- Gender- Both male and female
- Those who use smartphones for >3 hours per day
- Subjects with pain in the thumb and elbow

Exclusion criteria:

- Arm and Hand deformities/ Contracture
- Past history of wrist and elbow injuries
- Complications associated with another disease that affects the wrist and elbow
- Past history of surgeries of the arm/ hand

Procedure methodology

Participants were recruited from physiotherapy students at Garden City University, Bangalore. To be included in the study are students, both male and female, among the age group of 18-24 years with smartphone use of >5 hours per day. Exclusion criteria were students with arm and hand deformities/ contracture, past history of wrist and elbow injuries and those who had surgeries of the arm/ hand. In addition, students with complications associated with another disease that affects the wrist and elbow were also excluded. Study design was a cross-sectional study with random sampling where total estimated sample included 50 subjects. Nature and purpose of this study was explained and informed consent was taken from the participants. The required sample size was recruited by using the convenient sampling method.

The questionnaire was distributed which consisted of 4 parts including 1) Demographics (Name, Age, Gender, Hours of smartphone use) 2) Nomophobia Questionnaire to measure self- reported addiction to smartphone use. 3) Cornell Hand Discomfort Questionnaire for any pain and discomfort of the hand and interference with work 4) Patient Rated Wrist Evaluation to measure pain and disabilities of daily activities.

Statistical analysis

The data was analysed using SPSS 20.0 software. The data obtained was analysed using appropriate statistical techniques. The test used for statistical analysis were chi square test and independent t-test was used to determine the difference between baseline. Chi-square was performed to test for differences in proportions of categorical variables between two or more groups. The level $P < 0.05$ was considered as the cutoff value or significance.

III. RESULT

The sample size consisted of 50 participants, out of which 27 were females and 23 were males with maximum people having age group less than 20 years (26/50). Demographic profile of respondents according to age groups and gender is displayed in Table 1.

Table no 1: Demographic profile of respondents

Demographic profile	Number	Percent
Age groups		
<=20yrs	26	52.00
>=21yrs	24	48.00
Gender		
Male	23	46.00
Female	27	54.00
Total	50	100.00

Table 2 shows the comparison of age groups among participants who are 20 years or less of age and those who are 21 years and above with mean hours of smartphone use, scores of various questionnaires such as nomophobia scores, hand discomfort scores and patient- rated ulnar nerve score by independent t test.

Table no 2: Comparison of age groups (<=20yrs and >=21yrs) with mean hours of smart phone use, Nomophobia scores, Cornell hand discomfort scores and Patient rated ulnar nerve scores

Variable	Age groups	Mean	SD	SE	t-value	P-value
Hours of smart phone use	<=20yrs	7.92	1.41	0.28	0.7891	0.4339
	>=21yrs	7.63	1.24	0.25		
Nomophobia scores	<=20yrs	119.42	11.09	2.17	0.1990	0.8431
	>=21yrs	118.79	11.34	2.31		
Cornell hand discomfort scores	<=20yrs	42.42	14.46	2.84	0.2099	0.8347
	>=21yrs	41.50	16.63	3.39		
Patient rated ulnar nerve scores	<=20yrs	35.54	9.74	1.91	0.4741	0.6376
	>=21yrs	34.17	10.72	2.19		

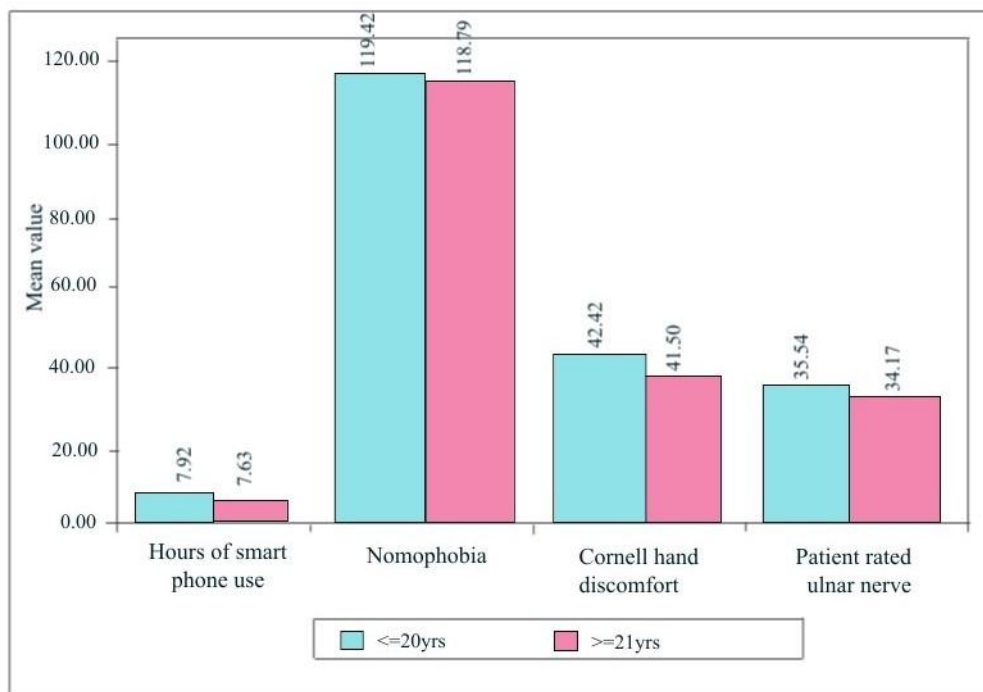


Figure 1

Table 3 shows the comparison based on gender (male and female) with mean hours of smartphone use, nomophobia scores, cornell hand discomfort scores and patient rated ulnar nerve scores by independent t test

Table no 3: Comparison of male and females with mean hours of smart phone use, Nomophobia scores, Cornell hand discomfort scores and Patient rated ulnar nerve scores

Variable	Gender	Mean	SD	SE	t-value	P-value
Hours of smart phone use	Male	7.09	1.00	0.21	-3.8537	0.0003*
	Female	8.37	1.31	0.25		
Nomophobia scores	Male	114.78	11.66	2.43	-2.7113	0.0093*
	Female	122.81	9.28	1.79		
Cornell hand discomfort scores	Male	34.13	14.35	2.99	-3.7465	0.0005*
	Female	48.67	13.07	2.52		
Patient rated ulnar nerve scores	Male	30.22	10.82	2.26	-3.2872	0.0019*
	Female	38.85	7.68	1.48		

*p<0.05

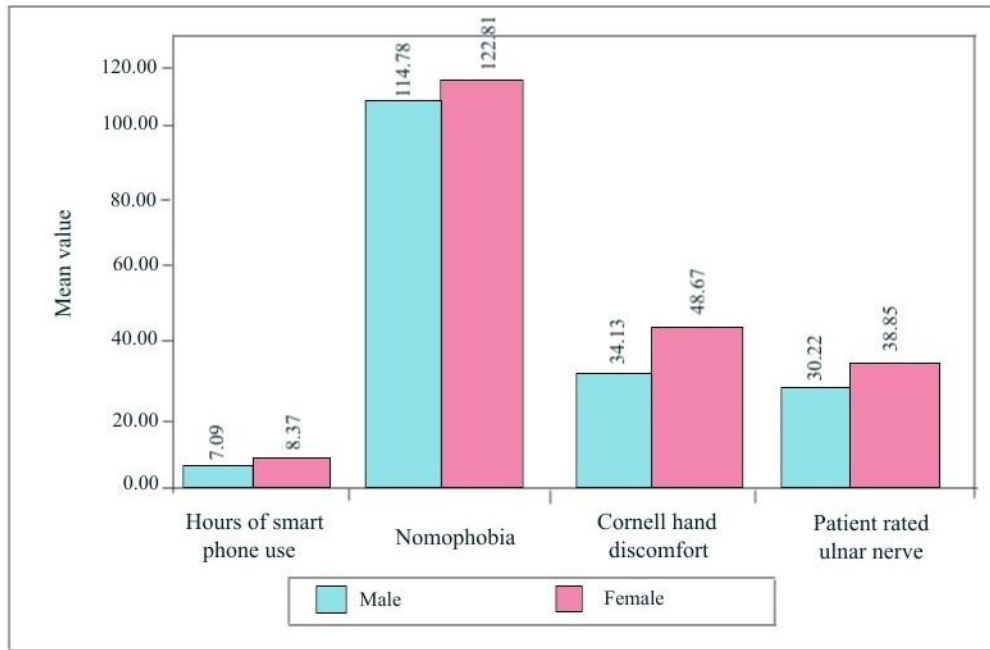


Figure 2

Table 4 shows the correlation study between the hours of smartphone use with the nomophobia, hand discomfort and ulnar nerve scores by Karl Pearson’s correlation coefficient

Table no 4: Correlation between hours of smart phone use with Nomophobia scores, Cornell hand discomfort scores and Patient rated ulnar nerve scores

Variables	r-value	t-value	p-value
Hours of smart phone use with Nomophobia scores	0.8085	9.5173	0.0001*
Hours of smart phone use with Cornell hand discomfort scores	0.7662	8.2597	0.0001*
Hours of smart phone use with Patient rated ulnar nerve scores	0.6868	6.5472	0.0001*

*p<0.05

The figure below shows the scatter diagram of correlation between the hours of smart phone use with the Nomophobia scores

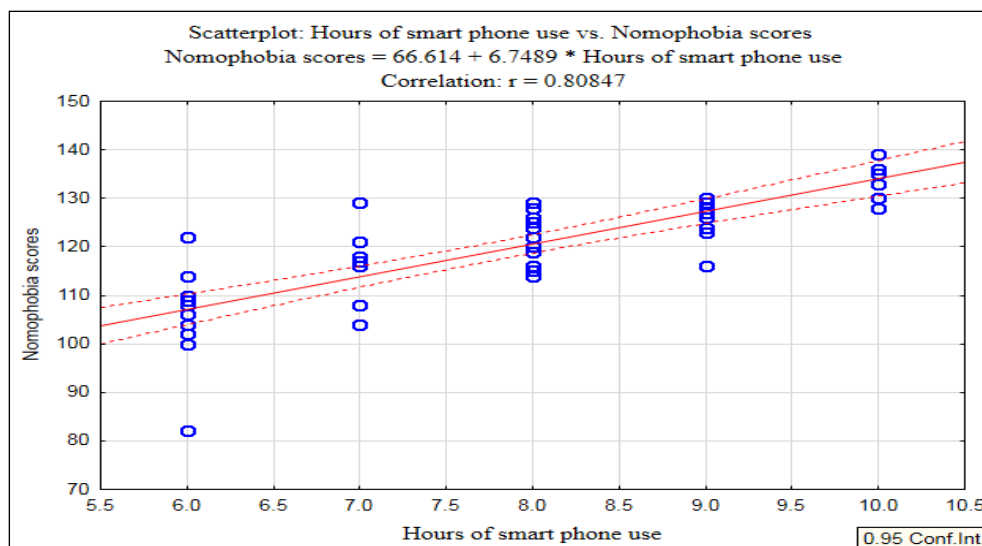


Figure 3

The next figure shows the scatter diagram of correlation between the hours of smart phone use with the Cornell hand discomfort scores

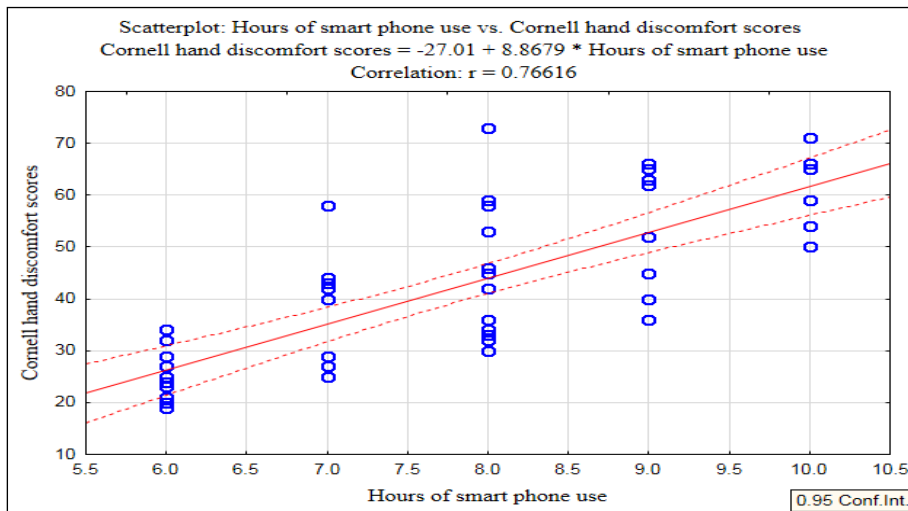


Figure no 4

Figure 5 shows scatter diagram of correlation between the hours of smart phone use with the Patient-rated ulnar nerve scores

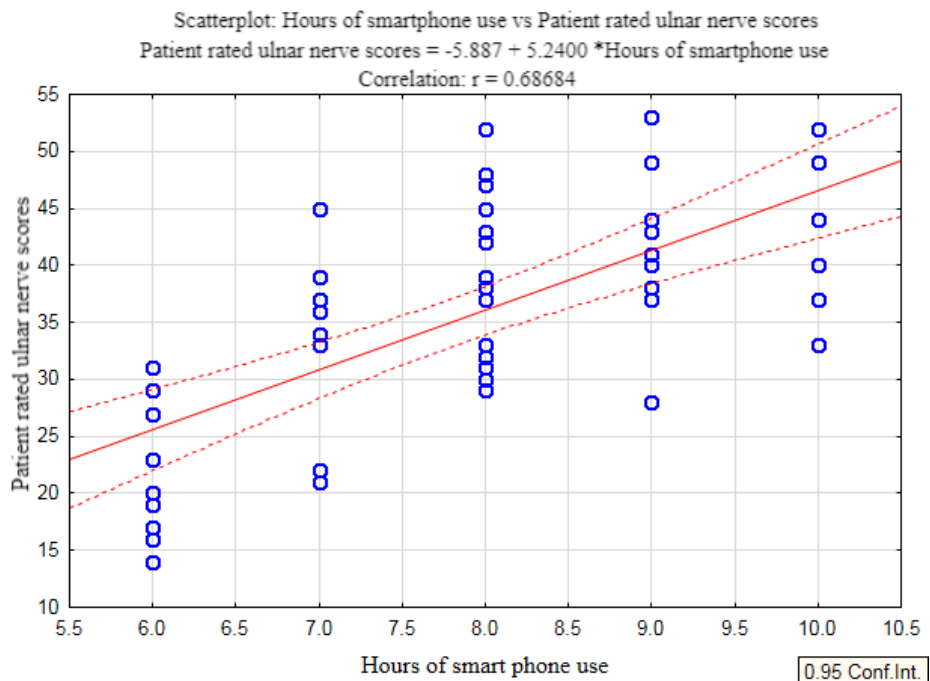


Figure no 5

Table 5 shows the correlation between the Nomophobia scores with the Cornell hand discomfort scores and Patient-rated ulnar nerve score by Karl Pearson’s correlation coefficient.

Table no 5: Correlation between Nomophobia scores with Cornell hand discomfort scores and Patient rated ulnar nerve scores by Karl Pearson’s correlation coefficient

Variables	r-value	t-value	p-value
Nomophobia scores with Cornell hand discomfort scores	0.6381	5.7420	0.0001*
Nomophobia scores with Patient rated ulnar nerve scores	0.6577	6.0497	0.0001*

*p<0.05

Figure 6 shows scatter diagram of correlation between Nomophobia scores with Cornell hand discomfort scores

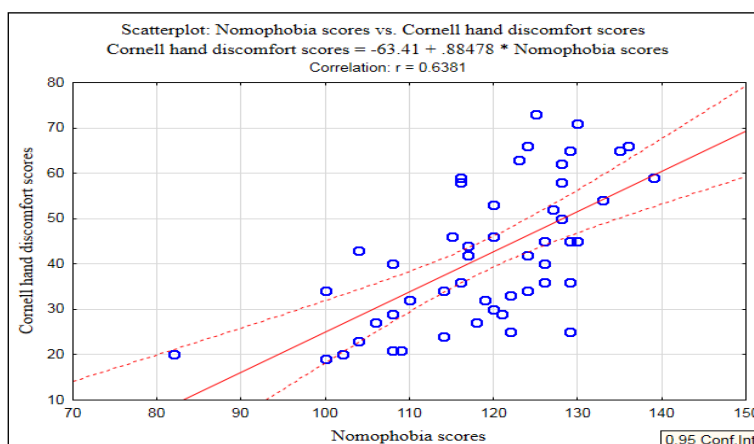


Figure no 6

Figure 7 shows the scatter diagram of correlation between Nomophobia scores with Patient-rated ulnar nerve scores

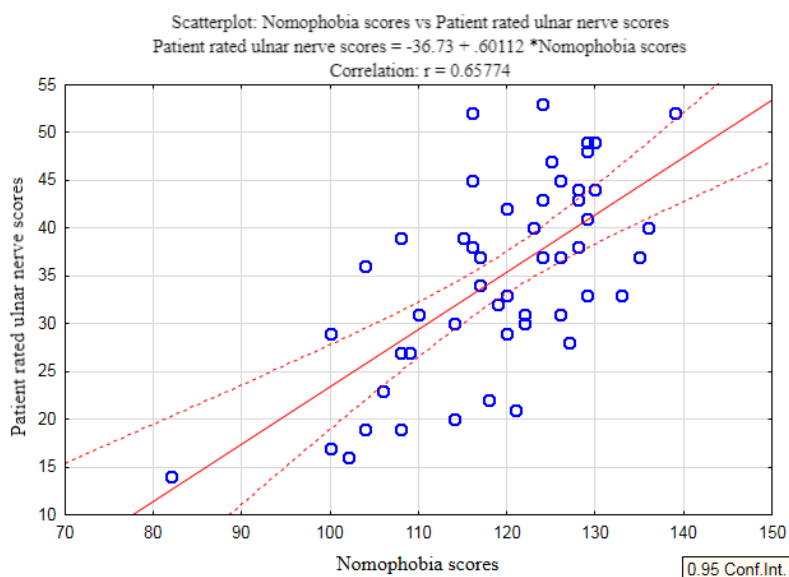


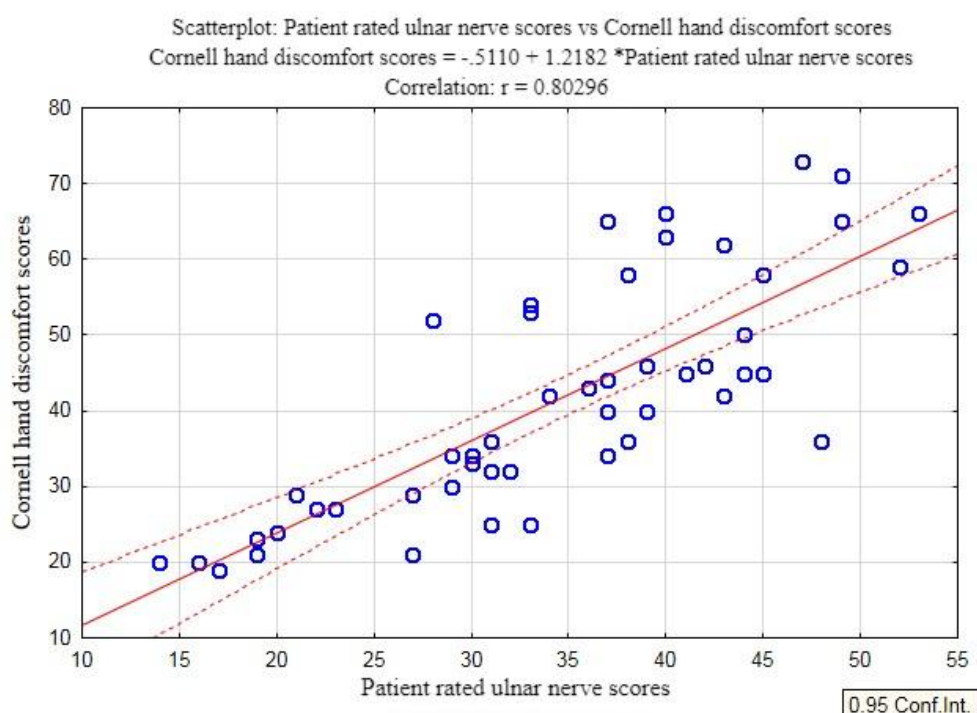
Figure no 7

The next table number 6 shows the correlation between the Cornell hand discomfort scores with the Patient-rated ulnar nerve scores by Karl Pearson’s correlation coefficient.

Table no 6: Correlation between Cornell hand discomfort scores with Patient-rated ulnar nerve scores

Variables	r-value	t-value	p-value
Cornell hand discomfort scores with Patient-rated ulnar nerve scores	0.8030	9.3336	0.0001*

The figure below shows the scatter diagram of correlation between Cornell hand discomfort scores with Patient-rated ulnar nerve scores



IV. DISCUSSION

The result in the present study showed that the influence of nomophobia (fear of being detached from smartphone network/ internet access) significantly correlated with various musculoskeletal disorders in the subjects who participated in this study. There is a very significant positive correlation between the Nomophobia scores and the Cornell hand discomfort scores ($p < 0.05$) and the correlation between the Nomophobia scores and the Patient-rated ulnar nerve scores also showed positive results ($p < 0.05$).

Nomophobia scores were higher which indicated significant nomophobia among young adults. Cornell hand discomfort scores showed moderate discomfort, while Patient-rated ulnar nerve scores also showed moderate disability. The hand discomfort might be related to frequent texting and holding of the smartphone in the hand especially due to prolonged use, which causes tendinitis of the muscles of the thumb predominantly. Prolonged and excessive usage of smartphones could lead to repetitive movements of the thumb and elbow which may associate with high risk of pain and if proper care is not taken may, in turn, lead to disabilities which might explain the association between Nomophobia and Patient-rated ulnar nerve scores in the present study. During texting, repetitive movements of the thumb and ulnar nerve compression while holding the mobile phone may occur. If texting thumb is left untreated, it could lead to weakness of the hand muscles especially the extensor pollicis longus and adductor pollicis, which may affect the activities of daily living such as self-care activities, doing household works and it may interfere with work as well. Serious permanent damage of the untreated texting thumb can be the result of overuse syndrome or repeated stress/strain injury. Studies have shown that the thumb cover motions in flexion, extension, abduction, adduction and opposition while texting. The main factor for triggering the development of tendinitis of the adductor pollicis longus and extensor pollicis longus is the position of the thumb during texting. Holding the phone for a prolonged time in a static loading position along with bent elbow positions and overuse of the hand muscles contributes to the development of the disorders of the upper extremity muscles and weakness of the muscles of the thumb predominantly. In earlier studies, similar symptoms like paresthesia and tendonitis or bursitis were reported.

Aymaan Baabdullah et al.³ concluded that students who use smartphones for a long duration have pain and stiffness in the hand such as the thumb and wrist. Another study done by Mohammed Bathiq et al.⁹ stated that using smartphones for a long period of time resulted in smartphone addiction and also significant disorders of the wrist/thumb muscles which is the most common factor of repetitive smartphone use. The repetitive and prolonged use of smartphone has negative impact on the dominant hand activities and daily duties.

Another study which was conducted by Sharan and Ajeesh⁴ concluded that texting has adverse effects on the musculoskeletal system of the hand among mobile phone users who are sending frequent text messages.

A study which was conducted by Sohel Ahmed et al.¹⁷ showed the population reported having pain at the neck and thumb due to usage of smartphone for a long duration. Musculoskeletal disorders such as pain and

discomfort in the thumb, wrist, shoulder and neck was seen among smartphone users who were nomophobic. Aaroj Fatima et al.¹ concluded that people who were experiencing more symptoms were more prone to disabilities and the condition should not be neglected because if left untreated, it could lead to functional disability. Priyal P Shah, et al.¹⁵ showed that disorders in the thumb and neck muscles were seen in smartphone-addicted students and these problems may be short-term initially but they may lead to serious long-term disabilities.

Another study reveals that most students use the smartphone for internet usage as well as texting, which greatly induces upper extremity and neck symptoms among students in the long run (Deivendran Kalirathinam et al)¹⁰. Sharan et al.⁵ stated that hand held devices promoted the extensive usage of the thumb while texting or gaming and associates with a high prevalence of musculoskeletal disorders. A study which was conducted by Eva Gustafsson, et al.⁶ showed that while texting, there is repetitive movements of the thumb and extensive neck flexion which caused pain and discomfort which implied the short-term effects on musculoskeletal disorders in the neck and upper extremities.

Hand-held devices like smartphones promotes the predominant use of the thumb and so, smartphone users should be properly advised on how to use other fingers as well while texting.

This study showed associations between texting and musculoskeletal disorders in smartphone users. Development of the smartphones with fancy designs are being made but the ergonomic problem with the keys and the screen in the same plane continues to remain the same. Some modifications have been introduced lately such as voice command and autocorrect which has reduced the amount of repetitive thumb movements. Ergonomic advices while using mobile phones have been taught to prevent the development of musculoskeletal disorders due to excessive texting, information about the risk of spending too much time using mobile phones have been spreading to reduce the long-term effects of smartphone usage for a long duration of time.

V. CONCLUSION

A highly significant positive correlation was found among nomophobic students who are smartphone users with the various musculoskeletal disorders of the hand. The result in this study implied mostly short-term effects of the wrist and elbow, but if proper care and precautions is not taken, may lead to more serious disorders which may be long-term.

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