



**PREVALENCE AND PATTERN OF NECK PAIN AMONG UNIVERSITY STUDENTS MOBILE PHONE USERS IN MAIDUGURI, NORTH-EASTERN NIGERIA**  
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**ABSTRACT**

Neck pain is a common musculoskeletal disorder that affects a significant portion of the population, and it has been suggested that mobile phone use may be a contributing factor. In Nigeria, even though university students use mobile phones more frequently, little is known about the association between this population's use of mobile phones neck pain. This study aimed to determine the prevalence and pattern of neck pain and its associations among university students and mobile phone users of the Faculty of Allied Health Sciences, University of Maiduguri, Borno State, Nigeria.

It is a cross-sectional study, conducted using a multistage sampling technique to select a total of 266 male and female clinical students. The Nordic questionnaire was used to determine the prevalence and pattern of neck pain. Descriptive statistics of frequency and percentages were used to summarize the Sociodemographic characteristics, prevalence, and pattern of neck pain among university student mobile users. Inferential chi-square statistics were used to determine the significant association between the prevalence of neck pain and Sociodemographic characteristics of the participants. Chi-square was used to determine the statistically significant association between neck pain and the pattern of mobile phone use.

Results: High neck pain prevalence (69.2%) was found among the university student mobile phone users. There was a significant association between neck pain and study departments ( $p < 0.05$ ). No significant association was found between the prevalence of neck pain and age, gender, and academic level ( $p > 0.05$ ), respectively. The majority of the students, 112(60.9%), use their phone for 5-10 hours daily, and sitting position, 90(48.9%), was the most adopted posture when using the phone. The majority used their phone for studying, 124(67.4%), and only 21(11.4%) used

their phones for gaming. A higher number, 119(64.7%), uses both hands while using their phones. There was a significant association ( $p < 0.05$ ) between neck pain and patterns of mobile phone usage.

Conclusion: The study showed a high prevalence of neck pain among clinical student mobile phone users. It is recommended that healthy mobile phone usage practices, such as taking regular breaks and using a mobile phone holder or stand to reduce neck flexion angle, should be encouraged.

**Keywords:** Mobile Users, Neck pain, Prevalence, Pattern, Students, University

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## INTRODUCTION

Neck pain is the second most prevalent musculoskeletal condition, after low back pain (Storheim & Zwart, 2014). Despite being little understood, it has a major impact on physical functioning, work productivity, and health-care expenses (Son *et al.*, 2013). Neck pain is a pain with or without referral in the upper limb or limbs that lasts for at least one day (Wu *et al.*, 2024). Neck pain is a complex condition, which means that various factors contribute to its onset and persistence. These include physical, psychosocial, and individual-related factors (Guzman *et al.*, 2009).

Neck pain can be classified as acute, sub-acute, and chronic Neck pain. Treatment protocols for acute and sub-acute neck pain are standard and widely agreed upon (Ishaq *et al.*, 2023). However, conventional treatments for chronic neck pain remain debatable and include interventions such as the use of nonsteroidal anti-inflammatory drugs (NSAIDs) and narcotics for pain management, manual therapy, strengthening exercises, education, dry needling, or laser therapy (De Oliveira-Souza *et al.*, 2025). Furthermore, the literature on long-term treatment outcomes has been inconclusive at best. Although symptoms of neck pain resolve in the acute phase, most cases do not resolve (Hush *et al.*, 2011; Carroll *et al.*, 2008). Also, more than one-third of patients with neck pain will develop long-lasting symptoms within 6 months (Ogwumike *et al.*, 2015). Exacerbations, as well as a high incidence of recurrence and persistence, are characteristics of neck pain (Ogwumike *et al.*, 2015).

Globally, the overall prevalence of neck pain in the general population ranges between 0.4% and 86.8%, while point prevalence ranges between 0.4% to 41.5%, and 12-month prevalence ranges from 4.8% to 79.5% (Hoy *et al.*, 2010). In 2021, the global age-standardized rates for incidence and YLDs of neck pain per 100,000 populations were 519 (95% uncertainty interval, 408-633) and 242 (163-343) per 100,000 populations, respectively (Wu *et al.*, 2025). Females also had a higher age-standardised prevalence rate (2890 [2330–3620] per 100000) than males (2000 [1600–2480] per 100000). It has been projected that by 2050, the prevalence of neck pain is expected to rise, with a larger effect expected in low-income and middle-income countries, and a rapidly ageing global population. Neck pain continues to pose a challenge in terms of disability burden worldwide. Differences in study population and genetic dispositions of participants accounted for these wide ranges in neck pain prevalence.

Studies in Northern Nigeria on the prevalence of neck pain are generally limited. In a study by Ogwumike *et al.* (2015), North-West Nigeria reported the lifetime

prevalence, 12-month, and point prevalence of neck pain among rural community dwellers as 67.9%, 65.9%, and 17.0%, respectively. Additionally, a high 12-month and point prevalence among truck drivers with neck pain in Maiduguri, North-Eastern Nigeria, were reported as 67.3% and 42% respectively in a study by Shittu *et al.* (2022).

Despite the high global and local prevalence of neck pain, its causes, associated risk factors have not been properly identified among the populace. Causes are largely multifactorial, resulting from sleep disorders, repetitive movements, lack of exercise, inflammatory and degenerative changes of the spinal discs, joints, ligaments, and nerves, sport-related events, work-related events, and poor posture (Wu *et al.*, 2024) while performing daily living activities. Daily life activities, such as prolonged use, can cause postural issues, leading to common neck pain. Long-term static positions, such as working on digital platforms and mobile phones in daily lives for extended periods, may cause neck muscle overload (Elvan *et al.*, 2024).

Mobile phones are the most popular portable electronic device nowadays, with recent estimates showing that at least 77% of the world's population has their mobile phone (Schabrun *et al.*, 2014). The main reason mobile phone use is emerging and becoming increasingly popular worldwide is that it is a reliable device for communication and entertainment (Kim, 2015). Mobile phones are also used as an adjunct to teaching and learning activities in academic institutions, and the use and development of mobile applications are rising (Kalra & Singh, 2017). According to Borelo *et al.* (2011), texting, emailing, scheduling appointments, and browsing the internet on smartphones consume approximately three and a half hours of university students' time per day. As a result of the increased usage of their mobile phones, for more than three hours per day university students commonly report pain in the neck, shoulders and at the base of the thumb, which can be attributed to the postures assumed by the students during mobile phone usage i.e. biomechanical factors (Cheung *et al.*, 2021; Gao *et al.*, 2023). Long-term usage of mobile phones can lead to the development of fixed head and neck positions, placing increased pressure on the neck muscles and spine (Elvan *et al.*, 2024).

Consequently, mobile phone addiction and usage are linked to musculoskeletal disorders, particularly in the neck and upper limbs. Heavy mobile phone use might produce considerable stress on the cervical spine, thus changing the cervical curve (Park *et al.* 2015). It increases pressure on the discs and ligaments between the cervical vertebrae, causing a forward head position that causes a flexion posture in

the cervical and thoracic regions, leading to muscle imbalance, which develops neck pain over time (Elvan *et al.*, 2024).

The user extends the neck to gaze down at the smartphone screen, leading to excessive lordosis in the lower cervical area and compensatory kyphosis in the upper thoracic region. This faulty posture is known as the "forward head", "turtle neck", or "text neck" posture, and it can cause inefficiency and fatigue by abnormally loading the articular structures of the cervical spine and neck extensor muscles due to excessive gravitational moment (Derakhshanrad *et al.*, 2021 and Damasceno *et al.*, 2018). These Static activities of neck flexion posture, which is the most common posture mobile phone users adopt when looking at their mobile phone visual display terminals for extended periods, potentially provide risk for neck pain (Zirek *et al.*, 2020).

Mobile phone users commonly maintain head flexion of 33°-45° from vertical when using a mobile phone (Lee *et al.*, 2015). A study by Ning *et al.* (2015) among university students also demonstrated that mobile phone users maintained significantly more neck flexion when operating a smartphone (44.7°). The weight on the spine dramatically increases when flexing the head forward at varying degrees; an adult head weighs 10 to 12 pounds in the neutral position. As the head tilts forward, the forces on the neck surge to 27 pounds at 15°, 40 pounds at 30°, 49 pounds at 45°, and 60 pounds at 60° (Hansraj, 2014). The visual display terminal, which has a small screen, requires users to bend their necks more, thereby also increasing the activity of the shoulder muscles (Straker *et al.*, 2008).

Even though the use of electronic device is on the rise and is associated with neck pain symptoms, studies reported that there is limited evidence regarding electronic device use, and various aspects of its use (i.e. amount of usage, features, tasks, and positions), and associated neck pain symptoms and exposures (Toh *et al.*, 2017). Moreover, our extensive search showed that there are scarce published regional reports about the prevalence of neck pain associated with neck pain in the sub-Saharan region, with limited or scarce primary data in Nigeria particularly, on the prevalence of neck pain among university students and mobile phone users.

In Nigeria, little is known about university students' usage of mobile phones and neck pain. Additionally, no study has been conducted on the prevalence and pattern of neck pain and its association with mobile phone use among university students in Maiduguri, Nigeria. Based on these gaps, we decided to assess the prevalence and pattern of neck pain and mobile phone use among university students in Maiduguri. Therefore, this study aims to investigate the prevalence and pattern of neck pain among university

students mobile phone users, Maiduguri, Nigeria.

## MATERIALS AND METHODS

**Study population:** The population of the study comprised clinical students (400 and 500 level) in the Faculty of Allied Health Sciences, University of Maiduguri.

**Inclusion Criteria:** Regular 400 and 500 level students of the Faculty of Allied Health Sciences, University of Maiduguri, who are using mobile phones for one year or above, were included in this study.

**Exclusion Criteria:** Students with a previous history of neck disease, Previous neck surgeries, Previous diagnosis of cervical disc problems, and those with a recent history of neck trauma were excluded from the study. First, second, and third-year students were also excluded from the study.

**Study Design and Sampling Technique:** The study was a cross-sectional survey, and a multi-stage sampling technique was used to recruit the participants for the study.

**Research Instrument: Standardized Nordic Questionnaire:** A modified Standardized Nordic Questionnaire (Kuorinka *et al.*, 1987) was used to determine the presence of neck pain among students in the past 12 months and seven days. The questionnaire contains a diagram that shows the approximate position of the body part referred to as neck.

This questionnaire contains four parts: Part I of the questionnaire elicited sociodemographic information of gender, age, academic level, and study department. Part II: Elicited information on characteristics related to mobile phone usage, which contains ten questions. Part III: Elicited information on postural pattern (characteristics) (Sitting, standing, lying on chest) while using a mobile phone, and it contains three questions. Part IV: Elicited information on characteristics related to pain, which consists of one question and a diagram of the body part referred to as neck). The questionnaire asked participants to indicate if they have experienced neck pain during the past 12 months. If they answer "yes" they were given a score of 1. If they answer "no", they were given a score of 0.

**Reliability and validity of the questionnaire:** The reliability of the Nordic Musculoskeletal Questionnaire, using test-retest methodology, found that the number of different answers ranged from 0 to 23%. Validity tested against clinical history and the Nordic Musculoskeletal Questionnaire found a range of 0 to 20% disagreement (Kuorinka *et al.*, 1987). Comparing pain in the last 7 days and clinical examination found sensitivity ranged between 71% and 88%.

**Study procedure:** An ethical approval for the study was sought and obtained from the Research and Ethics Committee of the College of Medical Sciences, University of Maiduguri. Informed consent was obtained from all participants who met the inclusion criteria. The content of the questionnaire and the procedure of the study were explained to the participants. Then, the questionnaires were distributed by the researcher to the respondents and were completed and returned. The study was carried out between the period of January 2024 to July 2024.

#### Data Analysis

1. Descriptive statistics of frequency and percentages were used to:

- Summarized the socio-demographic characteristics of the participants (gender, Age, study department, and academic level)
- Summarized the prevalence of neck pain
- Summarized the pattern (characteristics) related to mobile phone usage (Reading, Texting, social media, Watching movies) with neck pain.
- Summarized the characteristics related to posture while mobile phone.

2. The chi-square test was used to test the association between socio-demographic characteristics of the participants and neck pain (gender, age, study department, and academic level). The statistical package for social sciences SPSS version 20 was used to analyse the data. The level of significance was set at  $p < 0.05$ .

## RESULTS

### Sociodemographic characteristics of the participants

A total of two hundred and sixty-six (266) healthy students of the Faculty of Allied Health Sciences, University of Maiduguri, participated in this study. Overall, 161(60.5%) of the participants were male while 105 (39.5%) were female. Most of the participants 143 (53.8%) were within the 23 to 27-year age group. Most of the participants 72 (27.1%) were from department of medical laboratory science and a very large proportions, 187 (70.3%), were from the 500 level. The details on information on the Sociodemographic characteristics of the participants are shown in (Table 1.)

### Association between Sociodemographic characteristic of the participants and neck pain among students' mobile phone users

Based on the neck pain among students' mobile phone users. Majority of the students 184 (69.2%) reported that they experienced neck pain in the last 12 months; see Table 3. A statistically significant association was observed among the participants' departments and

**Table 2: Prevalence of neck pain among different Sociodemographic characteristics of the participants**

Variables	Yes n(%)	No n(%)
<b>Neck pain prevalence</b>	184(69.2)	82(30.8)
<b>Gender</b>		
Male	106(39.8)	55(20.7)
Female	78(29.3)	27(10.2)
<b>Age group</b>		
18-22 years	18(6.8)	10(3.8)
23-27 years	100(37.6)	43(16.2)
28-32 years	53(19.9)	25(9.4)
33-37 years	12(4.5)	3(1.1)
37 and above years	1(0.4)	1(0.4)
<b>Departments</b>		
Physiotherapy	47(17.7)	23(8.6)
Radiography	40(15.0)	28(10.55)
Medical Lab. Science	59(22.2)	13(4.8)
Nursing Science	38(14.3)	18(6.8)
<b>Academic level</b>		
400 level	59(22.2)	20(7.5)
500 level	125(46.9)	62(23.3)

*n*= population, %= percentage

neck pain in the last 12 months ( $\chi^2 = 9.104$ ,  $P < 0.028$ ).

However, there was no significant association observed between neck pain in the last 12 months and gender ( $\chi^2 = 2.127$ ,  $P > 0.05$ ), age group ( $\chi^2 = 1.576$ ,  $P > 0.05$ ) and academic level of the students ( $\chi^2 = 1.600$ ,  $P > 0.05$ ). See the details of association in table 3.

### Association of patterns of mobile phone use and postural characteristics among students with neck pain

The result found that a large proportion of students with neck pain used their mobile phone daily for reading (67.4%) and this was statistically significantly associated with neck pain ( $\chi^2 = 22.261$ ;  $p < 0.000$ ), while only 21(11.4%) students used their mobile phone for games daily. There was a statistically significant association between neck pain and using a mobile phone daily for social media ( $\chi^2 = 157.065$ ;  $p < 0.000$ ). Majority of student mobile phone users 112(60.9%) have typical usage time of 5-10 hours per day and it was significantly associated with neck pain among the students ( $\chi^2 = 80.033$ ;  $p < 0.000$ ). The result found the most common posture during use of the mobile phone to be significantly associated ( $\chi^2 = 109.869$ ;  $p < 0.000$ ) with neck pain. The result shows the proportion in sitting as 90(48.9%) followed by lying on back 71(38.6%), lying on chest 19(10.3%), and standing

**Table 3: Association between Sociodemographic characteristics of the participants and neck pain among students' mobile phone users**

Variables	Yes	No	$\chi^2$	P
<b>Gender</b>				
Male	106	55	2.127	0.145
Female	78	27		
<b>Age group</b>				
18-22	18	10	1.576	0.813
23-27	100	43		
28-32	53	25		
33-37	12	3		
37 and above	1	1		
<b>Department</b>				
Physiotherapy	47	23		
Radiography	40	28		
Med. Lab. Sc.	59	13	9.104	0.028*
Nursing Sc.	38	18		
Academic level				
400 level	59	20	1.600	0.206
500 level	125	62		

**Key: n= population, %= percentage,  $\chi^2$ =chisquare value, \*= Significant association**

4(2.2%). The result also found a significant association between neck pain and position when using mobile phone with 161(87.5%) of the students holding their phone below eye level by adopting position of neck flexion. The result significantly shows a higher proportion 119(64.7%) of the students using both hands to manipulate their phones were associated with neck pain ( $p < 0.000$ ). Significant association between neck pain and the number of social media used daily was reported ( $\chi^2 = 67.967$ ;  $p < 0.000$ ). Majority of mobile phone users 93(50.5%) used 2-3 different type of social media daily whereas 23(28.0%) of them used four or more types of social media daily. Details of the patterns of mobile phone and adopted postures are shown in table 4.

#### **Prevalence of neck pain with different Sociodemographic characteristics of the participants**

The result showed that there was a high 184(69.2%) prevalence of neck pain among clinical students who participated in this study. It was shown that 106(39.8%) of the participants within the male responded to having neck pain and 55(20.7%) responded to not having neck pain. While the female participants responded to having neck pain 78(29.3%) and 27(10.2%) of them responded to having no neck

**Table 4a: Association of Pattern of Mobile Phone Use and Postural Characteristics among Students with Neck Pain**

Variables	Neck Pain n (%)	$\chi^2$ Value	p
<b>Use for reading</b>			
Yes	124(67.4)		
No	60(32.6)	22.26	0.00
<b>Use for watching a video.</b>			
Yes	51(27.7)		
No	133(72.3)	36.54	0.00
<b>Use for gaming</b>			
Yes	21(11.4)		
No	163(88.6)	109.59	0.00
<b>Use for social media.</b>			
Yes	177(96.2)		
No	7(3.8)	157.067	0.00
<b>Total usage per day</b>			
1-5 hours	59(32.1)		
5-10 hours	112(60.9)		
>10 hours	13(7.1)	80.03	0.00

**Key: n= population, %= percentage,  $\chi^2$ =chi-square value, \*= Significant association**

**Table 1: Sociodemographic characteristics of the participants**

Variables	f	%
<b>Gender</b>		
Male	161	60.5
Female	105	39.5
<b>Age group</b>		
18-22	28	10.5
23-27	143	53.8
28-32	78	29.3
33-37	15	5.6
37 and above	2	0.8
<b>Department</b>		
Physiotherapy	70	26.3
Radiography	68	25.6
Med.. Lab. Sc.	72	27.1
Nursing Science	56	21.1
<b>Academic level</b>		
400 level	79	29.7
500 level	187	70.3

pain. The age group of 18-22 years 18(6.8%), 23-27 years 100(37.6%), 28-32 years 53(19.9%), 33-37 years 12(4.5%), and 37 and above years 1(0.38%) responded to having neck pain. While age group of 18-22 years 10(3.8%), 23-27 years 43(16.2%), 28-32 years 25(9.4%),

33-37 years 3(1.1%), and 37 and above years 1(0.38%) responded to having no neck pain. Students in the department of physiotherapy 47(17.7%), radiography 40(15.0%), medical lab. Science 59(22.2%) and the nursing science 38(14.3%) responded to having neck pain. Also, students from the department of physiotherapy 23(8.6%), radiography 28(10.5%), medical lab. Science 13(4.8%) and the nursing science 18(6.8%) responded to having no neck pain. The results found students in the 4<sup>th</sup> year of study 59(22.2%) and those in their 5<sup>th</sup> year 125(46.9%) responded to having neck pain. Likewise, students in 4<sup>th</sup> year 20(7.5%) and 5<sup>th</sup> year 62(23.3) responded to having no neck pain. Details of the prevalence of neck pain are shown in table 2.

## DISCUSSION

The study aimed to determine the prevalence and pattern of neck pain in the past 12 months among clinical students, mobile phone users of the Faculty of Allied Health Science, University of Maiduguri, Borno state, Nigeria. The results indicate that neck pain is common among them.

This study found a high prevalence, 184 (69.2%) among clinical students' mobile phone users, which is slightly higher than a similar study conducted in Ethiopia by (Ayhuallem *et al.*, 2021), who reported a moderate prevalence (47.4%) of neck pain among smart phone users in the university of Gondar, Ethiopia. It is slightly higher when compared with other studies in Taiwan (52%) (Yang *et al.*, 2017), India (46.9%) (Ahmed *et al.*, 2019), and Brazil (66.7%) (De Vitta *et al.*, 2020).

The prevalence of neck pain in this study was slightly lower than some of the similar studies carried out in other countries like China (78.9%) (Woo *et al.*, 2016), Singapore (74%) (Toh *et al.*, 2020), Saudi Arabia (72.6%) (Maayah *et al.*, 2023), and Pakistan (95.5%) (Iqbal *et al.*, 2024).

The differences in the prevalence of neck pain could stem from variations in the study participants, study areas, sample sizes, sampling techniques, inclusion criteria, and data collection methods. The disparity observed may also result from factors such as facilities available to students at their institution, exposure to electronic devices, patterns of use, daily usage hours, and other environmental factors between clinical students at the Allied Health Sciences University of Maiduguri, Nigeria, and those in the previously mentioned study areas. The rising prevalence of neck pain among mobile phone users appears to be increasing, likely linked to the shift from analogue devices to more advanced digital devices in all areas of life.

The prevalence of neck pain in this study was not statistically linked to any sociodemographic factors

**Table 4b: Association of Pattern of Mobile Phone Use and Postural Characteristics among Students with Neck Pain**

Variables	Neck Pain n (%)	$\chi^2$ - Value	<i>p</i>
<b>The frequent posture adopted during use</b>			
Sitting	90(48.9)		
Standing	4(2.2)		
Lying on back	71(38.6)		
Lying on chest	19(10.3)	109.87	0.00
<b>Position of phone</b>			
At eye level	16(8.7)		
Above eye level	7(3.8)		
Below eye level	161(87.5)	243.60	0.00
<b>Style of holding the phone</b>			
Left	15(8.2)		
Right	50(27.2)		
Both	119(64.7)	91.32	0.00
<b>Use other device</b>			
Yes	54(29.3)		
No	130(70.7)	31.39	0.00
<b>Type of device use</b>			
<b>Laptop/tablet</b>			
Yes	58(31.5)		
No	126(68.5)	25.13	0.00
<b>Desktop</b>			
Yes	7(3.8)		
No	177(96.2)	157.07	0.00
<b>Number of social media</b>			
1	9(4.9)		
2-3	93(50.5)	67.97	0.00
>4	23(28.0)		

Key: n= population, %= percentage,  $\chi^2$ =chi-square value, \*= Significant association

except for the students' academic department. The findings showed that students from the medical laboratory science department were significantly more likely to experience neck pain. This could be due to the posture they adopt during bench work, such as forward neck flexion while reviewing microscopes, in addition to their use of mobile phones.

Most of the student participants use their mobile phones for 5-10 hours daily, and this was significantly associated with the development of neck pain than other hours. This is in contrast with the study by Elvan *et al.* (2024) that reported mobile usage time of slightly more than 4 hours daily. This indicates that the present study population might have developed

unhealthy habits/behaviours of mobile phone use, and it shows that probably the usage may extend even during their academic or clinical hours, which might affect their concentration, thus their academic performance, apart from the resulting musculoskeletal effects. This effect was reported by Iqbal et al. (2024) in their study, where 38.8% agreed and 18.4% strongly agreed to having difficulty concentrating in class or during assignments during mobile phone use. The study by Elvan et al. (2024) reported a strong relationship between daily phone usage and neck pain. This finding is not surprising when compared with the high prevalence of neck pain reported in the current study, as it could be due to increased muscle, ligament, and tendons strain and stress due to the continuous prolonged abnormal posture, which is significantly associated with the neck pain observed among this subgroup of the population. Furthermore, a study by Cheung et al. (2021), shows that a merger phone usage of 10 minutes may contribute to the development of neck-related discomfort and pain, that believed to cause the changes in the biomechanical alignment of the neck and other factors. Additionally, over 6 hours per day of studying on a mobile phone is the most common factor associated with neck pain (Maayah et al., 2023).

A higher number of students (50.5%) use two to three types of social media per day in this study. This is consistent with the studies of Al-Dubai et al. (2013) and Toh et al. (2020). The similarity in results might be associated with increased hours of using different social media platforms adopted by students in recent times.

The study revealed that the majority of students use their mobile phones for reading and are more likely to develop neck pain than their counterparts. This finding is similar to a study conducted in Jeddah, Saudi Arabia, by Maayah et al. (2023), who reported that those who spent more time studying on smart devices were more likely to have a longer neck pain duration. Al-Hadidi et al. (2019), documented that engaging in active tasks with a mobile phone, such as playing games and reading, can lead to an increase in head and neck flexion angle and an increase in muscle activities in the upper trapezius, deltoid, and cervical extensor muscles.

The study also revealed sitting to be the most frequent posture adopted by the students while using their phones. This finding is consistent with the study by Iqbal et al. (2024) that reported sitting position is associated with more neck pain among their participants. This was also consistent with the study finding of Maayah et al. (2023), who reported sitting as the most common position when using a cell phone among their participants.

The study revealed majority of the students positioned their mobile phones below eye level

compared to the other levels. Though our study did not measure the angles of phone usage among the students, it was able to assess three different positions of holding mobile phones, namely holding at eye level (12%), above eye level (3.8%), and below eye level (84.2%), respectively. Namwongsa et al. (2019) reported that the higher the neck flexion angle position the higher the muscle activity. Muscle activity (cervical erector spinae) was significantly different between neck flexion at 0° to 15°, 30°, and 45° angles, respectively. Therefore, the lowest muscle activity was 0° neck flexion angle, whereas the highest muscle activity was at 45° neck flexion angle. Therefore, viewing their mobile phones below eye level might place high demand on the neck structures, which will, in turn, predispose them to muscle fatigue and imbalance.

The study revealed that students mainly use both hands while using their phones rather than using either the right or left hand. It also revealed use of both hands is significantly associated with neck pain than using either the left or right hand. This finding was not consistent with the study of Maayah et al. (2023), who reported that single-hand use was higher than using both hands among their participants. The literature documented higher levels of muscle activity in cervical erector spinae and upper trapezius while performing smartphone bilateral texting, smartphone unilateral texting, and computer typing tasks among young people with neck-shoulder pain when compared with healthy subjects (Xie et al., 2017).

These study findings have clinical implications in that they reveal factors such as demographics and patterns of mobile phone usage associated with neck pain among university students. The findings suggest that students use mobile phones for such long durations, adopting various neck flexion positions, which in turn can bring about neck disorders. The study recommends awareness lectures/seminars to promote healthy mobile phone usage practices, such as taking regular breaks and using mobile holders or stands to reduce neck flexion angle among students. The study also recommends awareness of the importance of posture and ergonomics, especially when using a mobile phone for an extended period. It also recommended the implementation of institutional policies that will limit the use of mobile phones in academic settings, such as during lecture or examination periods. It also recommends the use of billboards around institutional campuses to inform and remind students of the effects of prolonged mobile phone usage on their overall health and its preventive strategies.

Though the current study investigated thoroughly the prevalence and patterns of mobile use

among clinical university students, the study is not without limitations. First, the study only draws its sample population from clinical students. The cross-sectional study design could not make it possible to draw a causal effect, and convenient sampling was used to recruit participants; therefore, caution generalising findings to other populations. Another limitation is the use of self-reported measures to assess the presence of neck pain in the past 12 months, and patterns of mobile phone use can lead to the risk of recall and response biases.

The strength of the study is that it will provide reference data on the prevalence and pattern of students' mobile phone use for future investigations, considering the scarcity of research data among this population, especially in Nigeria. It also provided information on the association of neck pain with demographic and patterns of mobile use among clinical university students.

## CONCLUSIONS

In conclusion, this study found high neck pain prevalence (69.2%) among the students' mobile users. It found a statistically significant association between neck pain and study departments ( $p < 0.05$ ). No statistically significant association was found between the prevalence of neck pain with age, gender, and academic level ( $p > 0.05$ ), respectively. The majority of the students use their phones for 5-10 hours daily, and the sitting position was the most adopted posture used during phone usage. The majority used their phone for studying and only use their phone for gaming. A higher number use both hands while using their phones. A significant association between neck pain and the various patterns of mobile use was observed.

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