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ASSESSMENT OF CO MORBID FACTORS ASSOCIATED WITH TEXT NECK SYNDROME AMONG UNIVERSITY STUDENTS

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ABSTRACT

Background: A common health problem these days is text neck syndrome, a modern musculoskeletal ailment brought on by an overindulgence in handheld electronics, especially smartphones and tablets. Text neck syndrome is predicted to become more common as portable device use rises worldwide, calling for a greater comprehension of this issue. Everyday life have undergone tremendous change since the invention of digital technology, and screen time has become a necessary element of their schedule. The objective was to investigate text neck syndrome and its associated co-morbid factors among university of Lahore students.

Methodology: A cross sectional study was conducted among students. The study sample size was 185. Self-structured modified questionnaire, standardized questionnaire was forward head posture by Craniovertebral Angle (CVA), Cornell hand discomfort questionnaire (CHDQ) for SMS thumb and handheld dynamometer was used to assess the tip, palmar and key pinch strength. It was filled by participants fulfilling the inclusion criteria and result was noted. Data was analyzed by SPSS Version 25

Results: The age of participants has a mean of 21.56±2.3. 56.6% were males. The Body Mass Index (BMI) of participants has a mean of 24.8±6.5. Pearson correlation analysis between Craniovertebral Angle (CVA) and two variables, CDHQ-THUMB and CDHQ-PINKY TIP, among 185 participants reveals the correlation between CVA and CDHQ-THUMB is $r=-0.100$ with a p-value of 0.174. This indicates a very weak negative correlation, which is not statistically significant ($p > 0.05$). The correlation between CVA and CDHQ-PINKY TIP is $r=-0.063$ with a p-value of 0.396. This also indicates a very weak negative correlation, which is not statistically significant ($p > 0.05$).

Conclusion: There are various co-morbid factors associated with text neck syndrome but in the current study hand grip strength and forward head posture are positively correlated but smartphone finger and SMS thumb are negatively correlated.

Keywords: Text Neck Syndrome, Smartphone finger, Smartphone users, Grip strength and Forward Head Posture.

INTRODUCTION:

These days, the mobile (smart) phone is the most generally used and well linked gadget for a wide range of everyday tasks including social media site usage, gaming, movie watching, internet access, and information sharing. (1)Just 3,668 billion people used smartphones in 2016, which represents about 49% of the world's total population at the time. By 2022, there will be 6,648 billion smartphone users worldwide or approximately 83% of the total population(2).Over six billion people have smartphone data plans globally and by 2026, it is expected that this number will have raised to over 7.5 billion people. A study revealed that about 79% of the population in the age group 18-44 years have a smartphone with them most of the time(3).

University students in their 20s are the age group that uses smartphones the most among smartphone users. Approximately 96% of Americans between the ages of 18 and 24 used a mobile phone for 2.5 hours a day in 2017, 97% of these users were on smartphones. In Hong Kong and Thailand, 68.2% and 90%, respectively, of university students aged 18 to 24 who used smartphones reported experiencing neck pain as a result of their use. The incidence of this neck pain was linked to static and repetitive work, as well as awkward postures (4).

72% of adults in the United States including 92% of adults between the ages of 18 and 34 say they own a mobile phone, whereas the typical adult uses a smartphone for 5.1 hours of the day, the numbers are comparable for other age as well as(5). This had leads to muscular imbalances, postural compensations, and unfavorable anatomical and biomechanical changes in the cervical and thoracic spine all lead to overuse and fatigue of the muscles, which in turn causes pain. The percentage of people in India who have text neck syndrome varies from 25% to 47%. A study of undergraduate students revealed that 16.7% of them had text neck syndrome(6).

According to a recent Indian study, 469 students reported having neck pain and 292 students reported thumb pain as a result of using their smartphones for extended periods of time. In a different study, 19.1% of participants had positive Finkelsteine test results, and 66.4% of participants reported being addicted to their smartphones. According to a different study, 79 percent of participants between the ages of 18 and 44 use their smartphones virtually constantly during the day, going without one for just two hours(7).

A recent study found that people who use their phones constantly, regardless of age, are susceptible to text neck syndrome. In the modern world, text neck syndrome has emerged as a concerning global health issue that can impact a large number of people. Ignoring or failing to treat text neck syndrome in a timely manner can result in overuse syndrome, repetitive stress injury, and serious permanent damage(8) .

The term text neck syndrome was first describes by Dr. Dean L Fishman as a result of repetitive injury . Text neck syndrome also known as turtle neck posture is an overuse syndrome or repetitive stress injury, which occurs when you hung your head forward or down looking at your mobile, laptop, tab, computer or any other electronic device for an extended period of time. This leads to tightness of the shoulder muscles and soreness in the neck muscles and sometimes chronic headaches (9).An adult's head weighs 10 to 12 pounds in neutral position. The weight is calculated to be 27, 40, 49, and 60 pounds at 15°, 30°, 45°, and 60°, respectively, as the head flexes, it increases the load in the direction of the neck. Smartphone users often look down to focus on objects that are lowered and hold their heads forward for extended periods of time, which can strain their necks(10).

Text-neck syndrome has a number of side effects. They may affect the head, the heart, lungs, eyes, or psychological system. Numerous studies conducted worldwide have examined musculoskeletal pain in children and teenagers. The link between flexing toward the neck and cervical spine-related symptoms is now sufficiently supported by data (11).

Current studies have brought to light the following features of this complex syndrome: (i) pathology (with worse consequences of increasing the angle of neck curvature (ii) clinical features (they may include conditions affecting the head, eyes, and mind) (iii) pain in the musculoskeletal system (iv) symptoms related to the eyes

(v) electromagnetic risk (trouble sleeping, headaches, and vertigo) (vi) psychosocial effect (anxiety, tension, restlessness, agitation, panic disorder, poor communication, and reduced productivity) (vii) additional comorbidities (pulmonary illness, cardiovascular issues, and problems)(12).

Recent investigations have shown some co-morbid factors that are linked with smartphone use are pain in the neck, shoulder and thumb and the severity of the symptoms as the total time spent using the smartphone increases. Prolonged use causes faulty posture such as forward neck posture, slouched posture or rounded shoulders. Regarding mental health, recent studies showed that increased smartphone use might be related to sleep disturbances and depression (13).

Any discomfort that may or may not radiates into one or both upper limbs and last for at least a day is classified as neck pain . It is well recognized that there are many contributing factors to neck pain, with head and spinal posture being one of the most crucial ones. According to earlier research, extended neck flexion is strongly linked to neck pain in general population. Similarly, neck flexion is a common posture used by smartphone users to view their visual display terminals for extended periods of time (14).

The forward head posture, sometimes referred to as "Text Neck," "Reading Neck," or "Scholar's Neck," is a posture in which the head seems to be ahead of the body. A forward head position (FHP) is defined as the skull bending more than one inch forward over the atlas. FHP, which affects between 66 and 90 percent of the population, is the most common postural abnormality. A few simple exercises, postural awareness, and workplace modifications can help you start correcting this posture. A forward head posture affects not just the shoulders and neck but also the centre of gravity of your body, which in turn affects the trunk and all of the body's joints (15).

It has been determined that constant, repeated motions with the thumb and fingers provide a danger for diseases of the thumb and its musculature, such as extensor pollicis longus tendinopathy or myofascial pain syndrome in the hand. Research has indicated a correlation between the anthropometry of the user and the design of mobile devices, which can lead to hand, elbow, and shoulder pain and tiredness when

using hand-held handheld devices. The term use to describe this condition is called "SMS thumb"(16).

Smartphone pinky or smartphone finger is a condition that often affects the fifth finger's middle phalanx and can result in pain, discomfort and dysfunction down the same finger .In particular, using a single hand to operate a mobile phone for extended periods of time and depending on the little finger for stability and support puts a lot of strain on the muscles and tendons, which may cause the pinky finger to change morphologically or lose its contour (17).

These days, text neck syndrome is growing more common in practically every age group, but it is most common in the younger population and among university students. As technology advances, hand-held devices are posing a serious risk to human biomechanics due to their tendency to cause postural misalignment (21). Extended non-treatment of text neck syndrome can result in inflammation of the neck's muscles, ligaments, and nerves, which can cause long-term arthritic changes. In addition, flattening of the spinal curvature, disc compression, arthritis, disc herniation, misalignment of the spine, degeneration of the spine, etc., may occur. Mobile phone dependence is growing quickly, and long-term use has resulted in several musculoskeletal problems (18).

This study aimed to assess the co-morbid factors associated with text neck syndrome. There is an extreme need to create awareness among students about morbidities that result from text neck syndrome. This facilitates the development of effective prevention and treatment strategies, ultimately reducing the burden of this modern musculoskeletal disorder.

Methodology

A cross sectional study was conducted among students. The study sample size was 185. For seeking the permission from the participant, written consent form was signed by each participant. The confidentiality of data was maintained. The study was completed from April 2024 to June 2024. The self-structured modified questionnaire, standardized questionnaire was forward head posture by Craniovertebral Angle (CVA), Cornell hand discomfort questionnaire (CHDQ) for SMS thumb and handheld dynamometer was used to assess the tip, palmar and key pinch strength. It was filled by participants fulfilling the inclusion criteria and result was noted.

Sampling criteria

Inclusion criteria

- Age 19 to 25 years students (14).
- Both male and female students (14).
- Use mobile on an average of about three or more than three hours per day [21].
- Who have any symptoms of neck pain, shoulder pain, headache and numbness in hand (21).

Exclusion criteria

- Individuals who have any congenital, traumatic and surgical conditions of the cervical, thoracic spine and shoulder (21).
- Individuals with pre-existing muscular disorder (16).
- Unwilling participants (16).

RESULTS:

Table 1. Age

Statistic	Value
Mean	21.56
Standard Deviation	2.3
Minimum	18.0
Maximum	25.0

The age of participants has a mean of 21.56 years and a standard deviation of 2.3 years, indicating a moderate spread around the mean. The ages range from a minimum of 18.0 years to a maximum of 25.0 years

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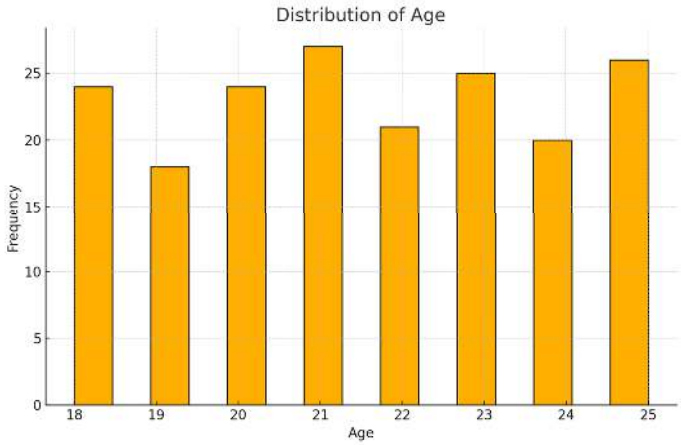

Figure 1. Age

Table 2. Craniovertebral Angle

Statistic	Value
Mean	51.46
Standard Deviation	3.06
Minimum	44.76
Maximum	60.44

This measures the forward head posture. Mean value was reported as 51.46±3.06, minimum was 44.76 and maximum was 60.44.

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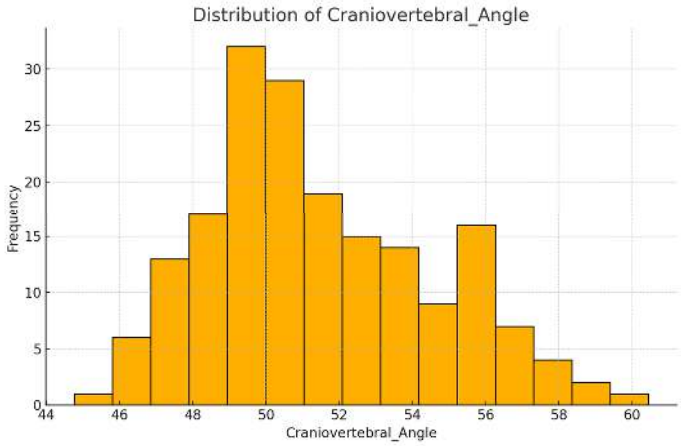

Figure 2. Craniovertebral Angle

Table 3 Tip Pinch Grip Strength

Statistic	Value
Mean	7.17
Standard Deviation	0.56
Minimum	5.32
Maximum	8.82

This measures the strength of the tip pinch grip. Mean was 7.17±0.56 with minimum value reported as 5.32 and maximum was 8.82.

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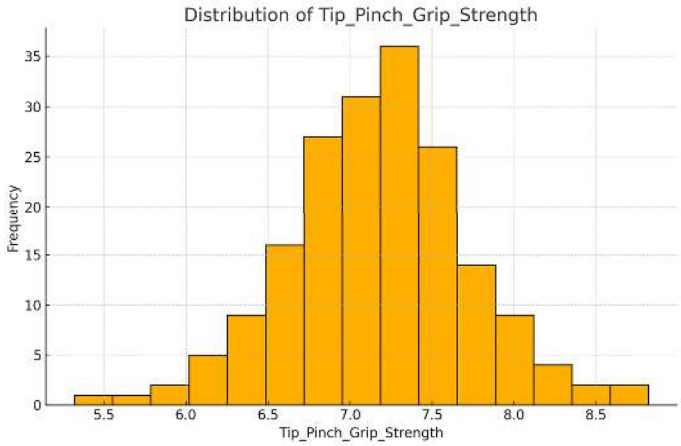

Figure 3. Tip Pinch Grip Strength

Table 4. Palm Grip Strength

Statistic	Value
Mean	35.61
Standard Deviation	2.53
Minimum	29.77
Maximum	41.42

The average Palm Grip Strength among the participants is 35.61 kg, suggesting a typical strength level for this grip type. The standard deviation of 2.53 kg indicates moderate variability in palm grip strength. The minimum value observed is 29.77 kg, while the maximum value is 41.42 kg, demonstrating the range of grip strengths within the study group.

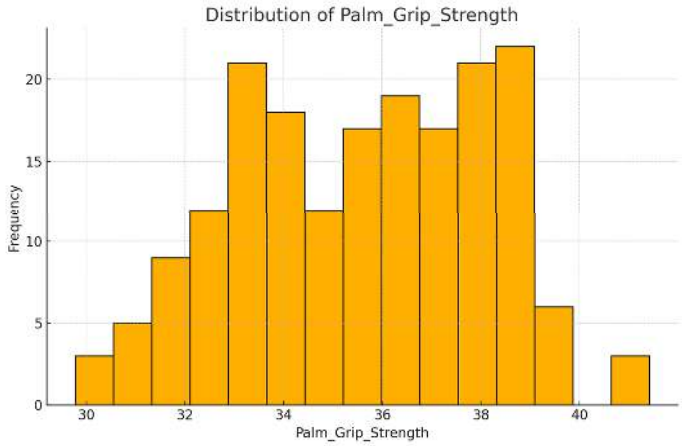

Figure 4. Palm Grip Strength

Table 5. Key Pinch Grip Strength

Statistic	Value
Mean	12.29
Standard Deviation	0.78
Minimum	10.3
Maximum	14.6

The analysis of Key Pinch Grip Strength reveals a mean value of 12.29, indicating the average grip strength observed in the sample. The standard deviation of 0.78 reflects the degree of variability or dispersion from the mean, suggesting that the grip strength measurements are relatively consistent. The minimum recorded value is 10.3, while the maximum is 14.6, showing the range of grip strength within the sample.

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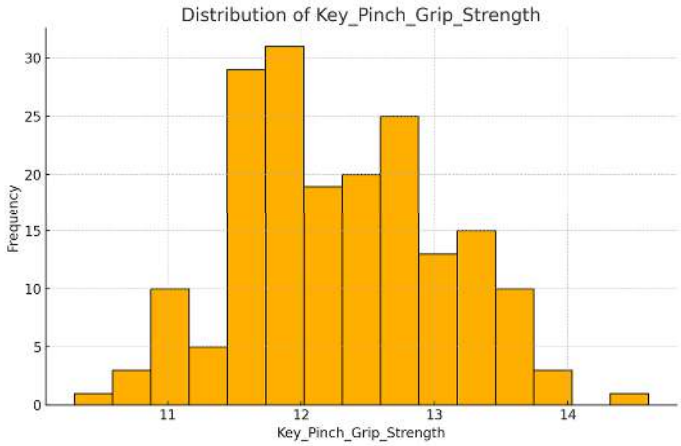

Figure 5: Key Pinch Grip Strength

Table 6. CDHQ Thumb Score

Statistic	Value
Mean	2.36
Standard Deviation	1.72
Minimum	0.0
Maximum	5.0

The CDHQ Thumb Score has a mean of 2.36 and a standard deviation of 1.72, indicating variability in the scores. The scores range from a minimum of 0.0 to a maximum of 5.0.

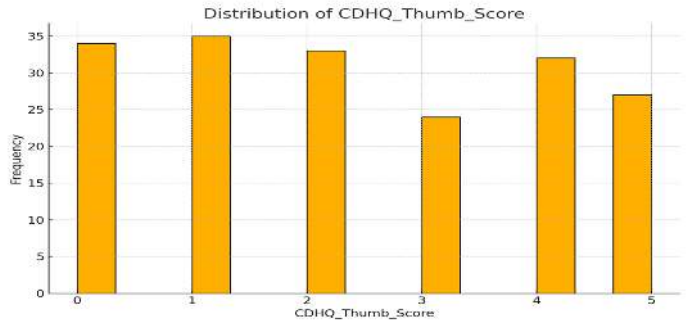

Figure 6. CDHQ Thumb Score

Table 7. CDHQ Pinky Tip Score

Statistic	Value
Mean	2.44
Standard Deviation	1.69
Minimum	0.0
Maximum	5.0

The CDHQ Pinky Tip Score has a mean of 2.44 with a standard deviation of 1.69, indicating some variability in the scores. The scores range from 0.0 to 5.0, providing insights into the average performance and spread of pinky tip scores among participants.

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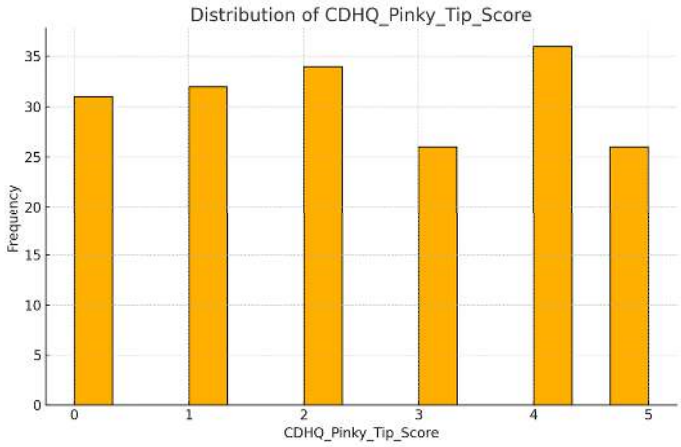

Figure 7: CDHQ Pinky Tip Score

Table 8. Correlation **Craniovertebral Angle (Degree) & Tip Pinch Grip Strength**

N=185		**Craniovertebral Angle (Degree)**	**Tip Pinch Grip Strength**
Craniovertebral Angle (Degree)	**Pearson Correlation**	1	.378**
	p-value		.000
Tip Pinch Grip Strength (Dominant Hand)	**Pearson Correlation**	.378**	1
	p-value	.000	

The Pearson correlation analysis between Craniovertebral Angle (CVA) and Tip Pinch Grip Strength in the dominant hand among 185 participants revealed a moderate positive correlation, r=0.378, which is statistically significant ($p < 0.001$).

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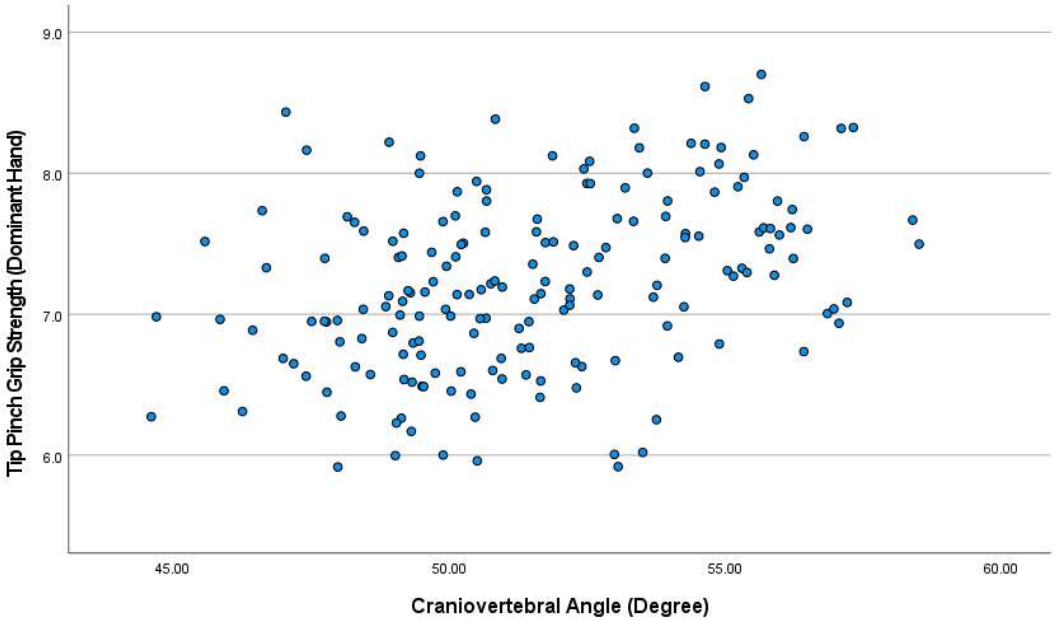

Figure 8. ***Correlation Craniovertebral Angle (Degree) & Key Pinch Grip Strength***

Table 9. Correlation Craniovertebral Angle (Degree) & Key Pinch Grip Strength

N=185		**Craniovertebral Angle (Degree)**	**Key Pinch Grip Strength**
Craniovertebral Angle (Degree)	**Pearson Correlation**	1	.281**
	Sig. (2-tailed)		.000
Key Pinch Grip Strength (Dominant Hand)	**Pearson Correlation**	.281**	1
	Sig. (2-tailed)	.000	

The Pearson correlation analysis between Craniovertebral Angle (CVA) and Key Pinch Grip Strength in the dominant hand among 185 participants shows a weak positive correlation, r=0.281, which is statistically significant ($p < 0.001$).

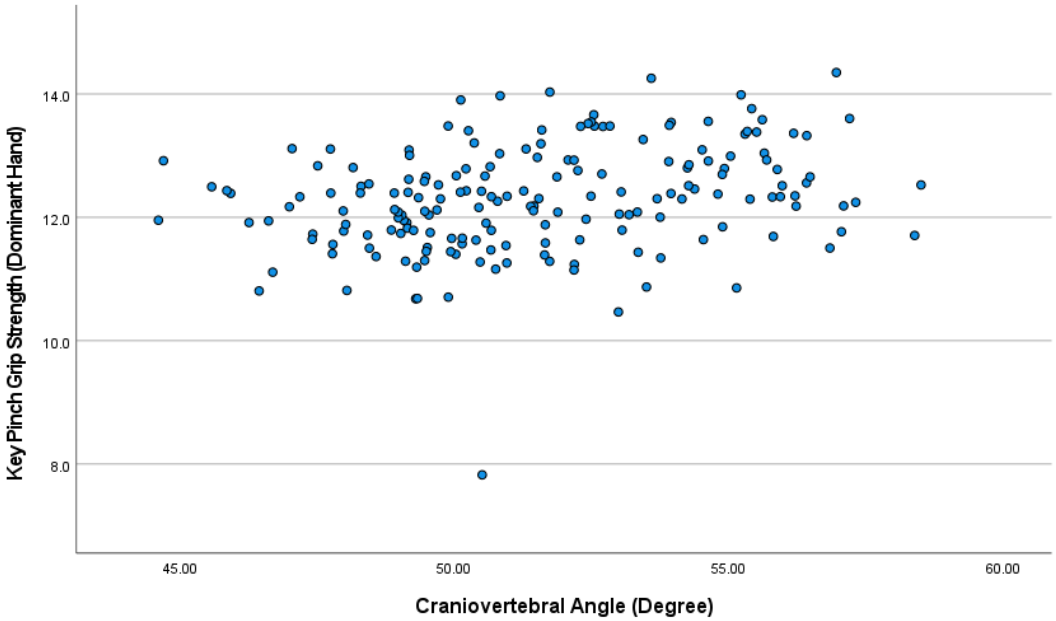

Figure 9. Correlation Craniovertebral Angle (Degree) & Key Pinch Grip Strength

Table 10. Correlation Craniovertebral Angle (Degree) & Palmar Pinch Grip Strength (Dominant Hand)

N=185		Craniovertebral Angle (Degree)	Palmar Pinch Grip Strength (Dominant Hand)
Craniovertebral Angle (Degree)	Pearson Correlation	1	.275**
	p-value		.000
Palmar Pinch Grip Strength (Dominant Hand)	Pearson Correlation	.275**	1
	p-value	.000	

The Pearson correlation analysis between Craniovertebral Angle (CVA) and Palmar Pinch Grip Strength in the dominant hand among 185 participants reveals a weak positive correlation, r=0.275, which is statistically significant ($p < 0.001$).

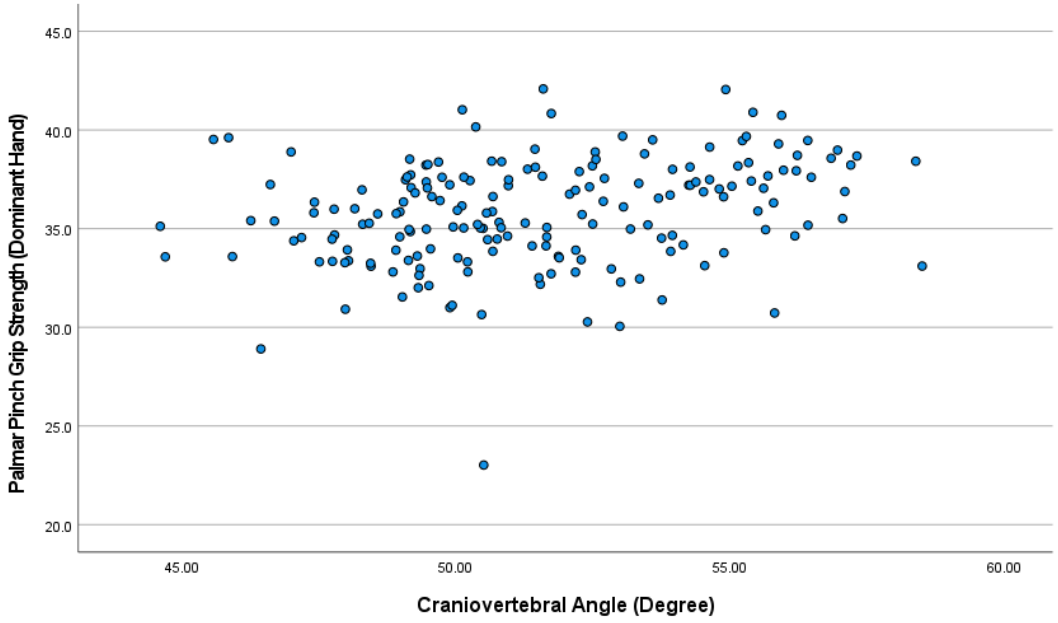

Figure 10. Correlation Craniovertebral Angle (Degree) & Palmar Pinch Grip Strength (Dominant Hand)

Table 11. Correlations CDHQ & Craniovertebral Angle

N=185		**Craniovertebral Angle (Degree)**	**CDHQ-THUMB**	**CDHQ-PINKY TIP**
Craniovertebral Angle (Degree)	**Pearson Correlation**	1	-.100	-.063
	p-value		.174	.396
CDHQ-THUMB	**Pearson Correlation**	-.100	1	.038
	p-value	.174		.611
CDHQ-PINKY TIP	**Pearson Correlation**	-.063	.038	1

	p-value	.396	.611	

The Pearson correlation analysis between Craniovertebral Angle (CVA) and two variables, CDHQ-THUMB and CDHQ-PINKY TIP, among 185 participants reveals the correlation between CVA and CDHQ-THUMB is r=−0.100 with a p-value of 0.174. This indicates a very weak negative correlation, which is not statistically significant ($p > 0.05$). The correlation between CVA and CDHQ-PINKY TIP is r=−0.063 with a p-value of 0.396. This also indicates a very weak negative correlation, which is not statistically significant ($p > 0.05$).

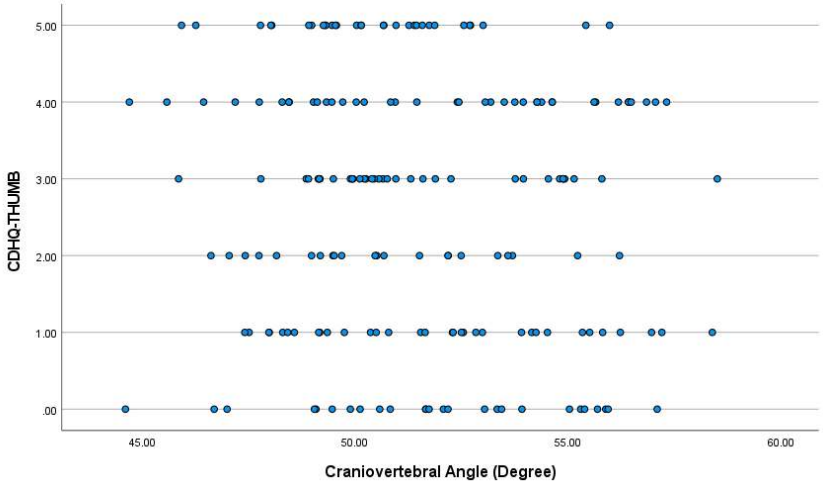

Figure 11. Correlation CDHQ & Craniovertebral angle

DISCUSSION:

This study aimed to assess the co-morbid factors associated with text neck syndrome. There is an extreme need to create awareness among students about morbidities that result from text neck syndrome. This facilitates the development of effective prevention and treatment strategies, ultimately reducing the burden of this modern musculoskeletal disorder.

This study found Craniovertebral Angle (CVA) and Tip Pinch Grip Strength in the dominant hand among 185 participants revealed a moderate positive correlation, r=0.378, which is statistically significant ($p < 0.001$). This study found that craniovertebral Angle (CVA) and Key Pinch Grip Strength in the dominant hand among 185 participants show a weak positive correlation, r=0.281, which is statistically significant ($p < 0.001$). This study found that craniovertebral Angle

(CVA) and Palmar Pinch Grip Strength in the dominant hand among 185 participants reveals a weak positive correlation, r=0.275, which is statistically significant ($p < 0.001$). Results are coherent with Indian study by M.Vijaykumar et al in which he concluded that 100% of the population had forward head posture with 89% of the population having poor hand strength (19).

But in contrast to current study results, study by Adel Alshahrani et al showed that among young, healthy male college students, smartphone addiction can have a negative impact on neck flexor endurance but not hand grip or pinch strength. in which hand grip strength was significantly correlated with forward head posture

Forward head and shoulder position is the most common issue that leads to neck pain, according to Lemola S. et al. To maintain straight vision when in the Forward Head Posture, the head is rotated towards the back and moved in front of the anatomical gravity midline(20). To preserve balance and put strain on the cervical spine and neck muscles, this results in an excessive anterior curvature in the lower cervical vertebrae and an excessive posterior curve in the upper thoracic vertebrae. A prior study discovered that when texting, the head flexion angle was greater than when viewing videos or browsing the internet. Therefore, prolonged shoulders and excessive head flexion that results in Forward Head Posture put people at danger(21).

The current study found that the Pearson correlation analysis between Craniovertebral Angle (CVA) and two variables, CDHQ-THUMB and CDHQ-PINKY TIP, among 185 participants reveals the correlation between CVA and CDHQ-THUMB is $r=-0.100$ with a p-value of 0.174. This indicates a very weak negative correlation, which is not statistically significant ($p > 0.05$). The correlation between CVA and CDHQ-PINKY TIP is $r=-0.063$ with a p-value of 0.396. This also indicates a very weak negative correlation, which is not statistically significant ($p > 0.05$).

Using a smartphone, which is a compact, electronic, these musculoskeletal problems are brought on by mobile devices, and can inflict lifelong injury to the ligaments, soft tissues, and joints in early life. Therefore, before the condition worsens, a lifestyle change is necessary to relieve the muscular pain and discomfort associated with text neck(22). The young population will be protected from this addictive and crippling syndrome by taking frequent breaks from texting, performing neck stretches, posture-focused exercises like chin tucks, Pilates and yoga to improve posture, as well as by

practicing proper mobile phone ergonomics, which will raise awareness among this demographic.

The limitations of this study data was collected from just University of Lahore students so data can not be generalized to other students of universities. Data was collected from just University of Lahore students so data can not be generalized to other students of universities. There may be confounding variables that were not controlled for in the study, such as physical activity levels, ergonomic practices, or pre-existing musculoskeletal conditions, which could influence the results. There may be confounding variables that were not controlled for in the study, such as physical activity levels, ergonomic practices, or pre-existing musculoskeletal conditions, which could influence the results. This study just focused on the musculoskeletal impact of text neck syndrome, not the psychological impact.

This study recommends to conduct on a large scale to generalize the results. A longitudinal study should be conducted to assess the causal relationship between confounding factors. As text neck syndrome is rising global disease, awareness programs should be initiated with the help of healthcare professionals to avoid the disabilities and burden. This study just focused on the musculoskeletal impact of text neck syndrome, not psychological impact.

CONCLUSION:

Text neck syndrome is a prevalent disorder in screen users and students. There are various co-morbid factors associated with text neck syndrome but in the current study hand grip strength and forward head posture are positively correlated but smartphone finger and SMS thumb are negatively correlated.

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