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Scrolling into Disability: The Effect of Screen Time and Posture Habits in Neck Disability among Colleges Students

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Abstract: **Background: Prolonged use of digital devices is common among college students and has been associated with neck pain and forward head posture. However, the independent contribution of objectively measured screen time and craniovertebral angle (CVA) to neck disability remains unclear. Aim: To investigate the relationships between screen time, forward head posture, neck pain intensity, and neck disability among health college students at Buraydah Private Colleges, Saudi Arabia. Methods: A cross-sectional study was conducted on 213 undergraduate students (nursing and physical therapy). Screen time was extracted from Digital Well-being/Screen Time features. Forward head posture was quantified by measuring the CVA using a universal goniometer. Neck pain intensity was recorded with a Visual Analogue Scale (VAS), and neck disability with the Neck Disability Index (NDI). Body Mass Index (BMI) was calculated from measured height and weight. Data were analyzed using descriptive statistics, chi-square tests, Pearson correlations, and multiple linear regression. Results: Mild to moderate neck disability was present in 24.4% of participants (10.8% mild, 13.6% moderate). More than half (54.5%) used screens for ≥8 hours/day, and 55% exhibited CVA ≤ 50° (forward head posture). Bivariate analyses showed significant associations between neck disability and age, specialty, BMI, and screen time ($p < 0.05$). No significant association was found between CVA and NDI ($p = 0.073$). Correlations among screen time, CVA, and VAS were weak and non-significant. Multiple linear regression revealed that none of the variables independently predicted neck disability ($R^2 = 0.034$, $p = 0.287$). Conclusion: Neck disability among health students is multifactorial, with no single dominant predictor. High screen time and forward head posture are common but do not independently cause disability in isolation. Holistic interventions addressing ergonomics, physical activity, and psychosocial factors are recommended.**

Keywords: **Neck disability; screen time; forward head posture; craniovertebral angle; college students; Digital Well-being Neck Disability Index.**

1. INTRODUCTION

The 21st century has witnessed an unprecedented digital transformation, fundamentally reshaping patterns of communication, education, and daily life. The widespread use of smartphones, tablets, laptops, and other electronic devices has made digital engagement an integral part of modern living. This shift is particularly evident among adolescents and young adults, where device usage has reached remarkably high levels. Recent global estimates indicate that approximately 87% of individuals aged 14-18 years and 79% of those aged 12-15 years regularly use mobile devices. Within this demographic, college students represent one of the most intensive user groups due to academic demands, social interaction, and entertainment needs **(Hemajothi & Kumar Jain, 2022).**

The transition toward digital education systems, particularly following the COVID-19 pandemic, has further increased screen exposure among students. Online lectures, virtual assignments, and prolonged study sessions have contributed to extended daily screen time, often exceeding several hours. While digital technologies offer significant benefits in terms of accessibility, efficiency, and flexibility of learning, growing evidence suggests that excessive use may have unintended adverse effects on physical health, particularly the musculoskeletal system **(Gotum et al., 2025, Elrefaey, et al 2025)**

Among the various health concerns associated with prolonged device use, neck pain has emerged as a significant global issue. It is currently recognized as one of the leading causes of disability worldwide, with an annual prevalence exceeding 30% in the general population. Data from the Global Burden of Disease (GBD) Study 2017 reported age-standardized prevalence and incidence rates of 3551.1 and 806.6 per 100,000 population, respectively, along with substantial years lived with disability attributable to neck pain. These findings highlight the considerable impact of neck pain on public health **(Kazeminasab et al., 2022).**

1.1 Neck Pain in College Students

The burden of neck pain appears to be particularly pronounced among college students, a population characterized by prolonged sitting, sustained near-work activities, and extensive use of digital devices. Evidence from multiple regions consistently demonstrates a high prevalence of neck pain within this group. For instance, a study conducted among medical students in Northern Saudi Arabia reported that 68.6% experienced neck pain within the previous month. Similarly, another study in Saudi Arabia found that 79.5% of university students reported neck pain, with 43.3% classified as having mild disability and 29.3% moderate disability according to the Neck Disability Index (NDI) **(Algarni et al., 2017).**

These findings indicate that neck pain among college students is not merely a transient or minor complaint but a widespread condition with significant functional consequences. It can adversely affect academic performance, concentration, and overall quality of life. The high prevalence in this population highlights the importance of identifying modifiable risk factors-particularly those related to lifestyle and behavioral patterns to guide effective prevention and intervention strategies **(Côté et al., 2016).**

1.2 Screen Time and Musculoskeletal Health

One of the most significant contributors to musculoskeletal complaints in recent years is prolonged screen exposure. The average daily screen time among young adults has increased substantially, with estimates ranging from 7 to 10 hours per day when both academic and non-academic activities are considered. This rise is primarily driven by the integration of technology into education, increased engagement with social media, and the widespread use of digital entertainment platforms **(Zablotsky et al., 2024).**

A growing body of evidence supports a strong association between excessive screen time and musculoskeletal disorders, particularly neck pain. Several studies have identified prolonged mobile device use, poor posture during device use, and reduced physical activity as key contributing factors to musculoskeletal strain. For instance, a cross-sectional study conducted at King Khalid University reported that mobile phone use with hands positioned below eye level significantly increased the risk of musculoskeletal pain (OR = 2.276, p = 0.014). Additionally, higher levels of smartphone dependency have been linked to an increased prevalence of neck, shoulder, and upper limb pain **(Alanazi & Kashoo, 2025).**

However, the relationship between screen time and musculoskeletal symptoms is complex and multifactorial. Some studies suggest that this association may be influenced by confounding factors such as physical inactivity, poor sleep quality, and psychological stress. Furthermore, much of the existing literature relies on self-reported screen time, which is prone to recall bias and inaccuracies. The use of objective monitoring tools, such as smartphone-based Digital Well-being applications, represents an important advancement in improving the accuracy of screen time measurement and enhancing the quality of research in this field **(Deivendran et al., 2025).**

1.3 Forward Head Posture as a Key Mechanism

The adverse effects of prolonged screen use are largely mediated by postural changes, particularly forward head posture (FHP), commonly referred to as “text neck.” This posture is characterized by anterior displacement of the head, rounded shoulders, and a reduction in the natural cervical lordotic curve. Sustained neck flexion during the use of handheld devices increases the mechanical load on cervical structures, including muscles, ligaments, and intervertebral discs **(Kim & Koo, 2016).**

From a biomechanical perspective, even a slight forward displacement of the head can significantly increase the effective load on the cervical spine. It has been estimated that for every inch of forward head movement, the load on the cervical spine increases by approximately 4.5 kg. Over time, this excessive loading may lead to muscle fatigue, soft tissue strain, reduced range of motion, and the development of chronic pain conditions **(Kim, 2020).**

The craniovertebral angle (CVA) is widely used as an objective measure to assess forward head posture. It is defined as the angle between a horizontal line through the seventh cervical vertebra (C7) and a line connecting C7 to the tragus of the ear. A smaller CVA indicates greater forward displacement of the head. Research has shown that a reduced CVA is associated with increased neck pain severity and greater functional disability. Additionally, factors such as body mass index (BMI) and physical activity levels may influence CVA, highlighting the multifactorial nature of postural dysfunction **(Côté et al., 2019).**

1.4 Assessment of Neck Pain and Disability

Accurate assessment of neck pain and its functional impact is essential in both clinical practice and research. The Neck Disability Index (NDI) is one of the most widely used and validated tools for evaluating the effect of neck pain on activities of daily living. It consists of ten domains, including pain intensity, personal care, concentration, and work performance, with higher scores indicating greater disability **(Côté et al., 2019).**

Pain intensity is commonly measured the Visual Analogue Scale (VAS), a simple and reliable tool that allows individuals to rate their pain along a continuous scale. In addition to these subjective measures, objective assessments such as the craniovertebral angle (CVA) can be obtained using instruments like a universal goniometer, providing an accessible and reliable method for evaluating postural alignment **(Raja et al., 2020).**

Recent technological advances have enabled the use of smartphone-based applications, such as Digital Well-being tools, to objectively monitor screen time. These tools reduce reliance on self-reported data and improve the accuracy of exposure assessment. Furthermore, body mass index (BMI) is often included in musculoskeletal research as a potential confounding factor due to its associations with postural characteristics and levels of physical activity **(Kazeminasab et al., 2022).**

1.5 Significant of the Study

Despite the growing body of research on neck pain among students, several gaps remain. Many studies rely on self-reported screen time, lack objective assessment of posture, or fail to account for potential confounding factors such as BMI and physical activity. Moreover, only a limited number of studies have simultaneously examined the relationships between screen time, forward head posture, and functional disability using validated and objective measurement tools **(Gotum et al., 2024).**

In the context of Saudi Arabia, where smartphone usage is particularly high, there is a need for comprehensive investigations that integrate behavioral, biomechanical, and clinical assessments. Therefore, the present study aims to evaluate the association between screen time, forward head posture (measured using CVA), and neck disability (assessed using NDI), while accounting for BMI and other influencing factors **(Almutairi et al., 2024).**

Understanding these relationships is essential for developing targeted preventive strategies, promoting ergonomic awareness, and reducing the burden of neck pain among college students. Ultimately, such efforts can contribute to improving students' physical health, academic performance, and overall quality of life.

Aim of the study

This study aims to investigate the associations between screen time, forward head posture, neck pain intensity, and neck disability, and to determine whether these factors contribute to neck-related functional limitations in college students.

Research question

What extent do screen time and postural habits (forward head posture) influence neck disability among college students?

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2. MATERIALS AND METHODS

Study Design

This cross-sectional observational study was adopted to carry out this study.

Setting

College of Applied Medical Sciences at Buraydah Colleges. Data were collected at a single time point from students in the Nursing and Physical Therapy departments.

Participants and Sampling

Primary data were collected from undergraduate students using convenience sampling, with participants recruited via classroom announcements and social media. A total of 213 students completed the study and were included in the analysis.

Inclusion Criteria

Participants were eligible for inclusion if they:

- Were between 18 and 30 years of age.
- Were full-time undergraduate students in the Nursing or Physical Therapy departments at Buraydah Colleges.
- Owned a smartphone with either the Digital Wellbeing (Android) or Screen Time (iOS) feature enabled.
- Agreed to participate and provided written informed consent.

Exclusion Criteria

Participants were excluded if they had:

- A history of cervical spine surgery, fracture, or dislocation.
- Diagnosed neurological disorders such as multiple sclerosis or cervical radiculopathy.
- Vestibular or somatosensory disorders affecting balance.
- Used a cervical brace or received active physical therapy treatment for neck pain within the previous three months.
- Pregnancy.
- Acute neck trauma, such as whiplash injury, within the previous six weeks.

Tools of Data Collection:

The following instruments were used for data collection:

1. A universal goniometer (Baseline®, 12-inch) to measure the craniovertebral angle (CVA).
2. The Arabic version of the Neck Disability Index (NDI) to assess neck-related functional disability.
3. A 10-cm Visual Analogue Scale (VAS) to evaluate current neck pain intensity.
4. Smartphone-based Digital Wellbeing (Android) or Screen Time (iOS) applications to record average daily screen time.

Data Collection Procedure:

- Data were collected over a four-week period following a standardized protocol. Eligible students were informed about the study, and those who agreed provided written informed consent before participation.
- Participants completed a demographic questionnaire (age, gender, and academic specialty). Neck pain intensity was assessed using the Visual Analogue Scale (VAS), and neck-related disability was evaluated used the Arabic version of the Neck Disability Index (NDI).

- Forward head posture was measured by assessing the craniovertebral angle (CVA) using a universal goniometer. Participants sat upright in a relaxed position while the examiner identified the C7 spinous process and the tragus of the right ear. Two measurements were taken, and the mean value was used for analysis.
- Average daily screen time over the previous seven days was recorded using Digital Wellbeing (Android) or Screen Time (iOS) applications.
- Anthropometric data were also collected. Body weight was measured to the nearest 0.1 kg using a calibrated digital scale, and height was measured to the nearest 0.5 cm using a stadiometer. Body mass index (BMI) was calculated (kg/m²).
- All data were anonymized using unique participant codes and securely stored on a password-protected computer accessible only to the research team.

Ethical consideration

- A verbal consent was taken from diabetic patients before interview after a full explanation for the purpose of the research. The researcher emphasized that their participation is voluntary.
- Anonymity of individual responses was guaranteed and confidentiality of data was maintained. Code numbers were used instead of names.
- Privacy was ensured for all subjects.

Statistical Analysis:

- Statistical analysis was performed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Statistical significance was set at $p < 0.05$ using two-tailed tests.
- Descriptive statistics were calculated for all variables. Continuous data were presented as mean ± standard deviation (SD), while categorical data were expressed as frequencies and percentages.
- Bivariate analyses were conducted using independent samples t-tests or one-way analysis of variance (ANOVA) to compare Neck Disability Index (NDI) scores across groups. Associations between categorical variables, such as NDI severity and screen time categories, were evaluated using the chi-square test or Fisher's exact test, as appropriate.
- Pearson's correlation coefficient (r) was used to assess relationships among screen time, craniovertebral angle, neck pain intensity, and neck disability.
- Multiple linear regression analysis (enter method) was performed to identify predictors of neck disability, with NDI score as the dependent variable. Independent variables included age, gender, BMI, screen time, craniovertebral angle, and VAS score. Results were reported as unstandardized coefficients (B), 95% confidence intervals, and p-values.

3. RESULTS

Table 1 summarizes the demographic and anthropometric characteristics of the 213 participants. The mean age was 22.23 ± 2.38 years, with ages ranging from 18 to 30 years. The majority of participants (70.4%) were in the 21–23 years age group, followed by 16.9% in the 18–21 years group and 12.7% in the 23–26 years or older group (Figure 1).

Regarding academic specialty, nursing students constituted 62.4% of the sample (n = 133), while physical therapy students represented 36.6% (n = 80). The mean body weight was 76.46 ± 10.28 kg, and mean height was 173.79 ± 3.65 cm.

Body mass index (BMI) classification revealed that 29.1% of participants were underweight (BMI < 18.5 kg/m²), 18.8% had normal weight (18.5–24.9 kg/m²), 19.7% were overweight (25–29.9 kg/m²), 28.2% were obese class I (30–34.9 kg/m²), and 4.2% were obese class II (35–39.9 kg/m²) (Figure 2). Notably, obesity and underweight were both highly prevalent, while normal weight participants formed the smallest single category.

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Table 1: Demographic Characteristics of the Study Sample (N = 213)

Demographic Characteristics	Study sample (N=213)	
	No	%
Age		
• 18-21 years	36	16.9
• 21-23 years	150	70.4
• 23-26 or more	27	12.7
Min -Max	**18-30**	
Mean ± SD	**22.23 ± 22.23**	
Specialty		
• Nursing	133	62.4%
• Physical therapy	80	36.6%
Weight (Mean ±SD)	**76.46± 10.278**	
Height (Mean ±SD)	**173.79± 3.646**	
BMI (Weight/ Hight^2)		
• Underweight (less than 18.5)	62	29.1
• Normal weight (18.5 to 24.9)	40	18.8
• Overweight (25to 29.9)	42	19.7
• Obese (30 to 34.9)	60	28.2
• Obese (35-39.9)	9	4.2

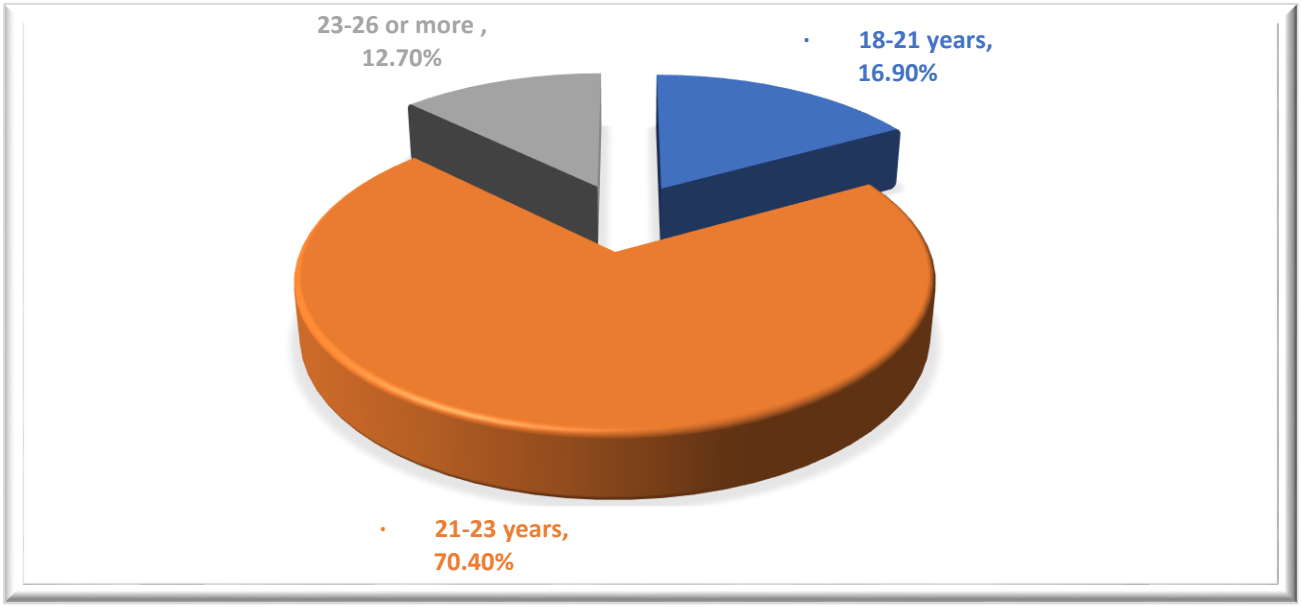

Figure 1: Distribution of Age Categories Among Study Participants (N = 213)

Body mass index (BMI) classification revealed that 29.1% of participants were underweight (BMI < 18.5 kg/m²), 18.8% had normal weight (18.5–24.9 kg/m²), 19.7% were overweight (25–29.9 kg/m²), 28.2% were obese class I (30–34.9 kg/m²), and 4.2% were obese class II (35–39.9 kg/m²) (Figure 2). Notably, obesity and underweight were both highly prevalent, while normal weight participants formed the smallest single category.

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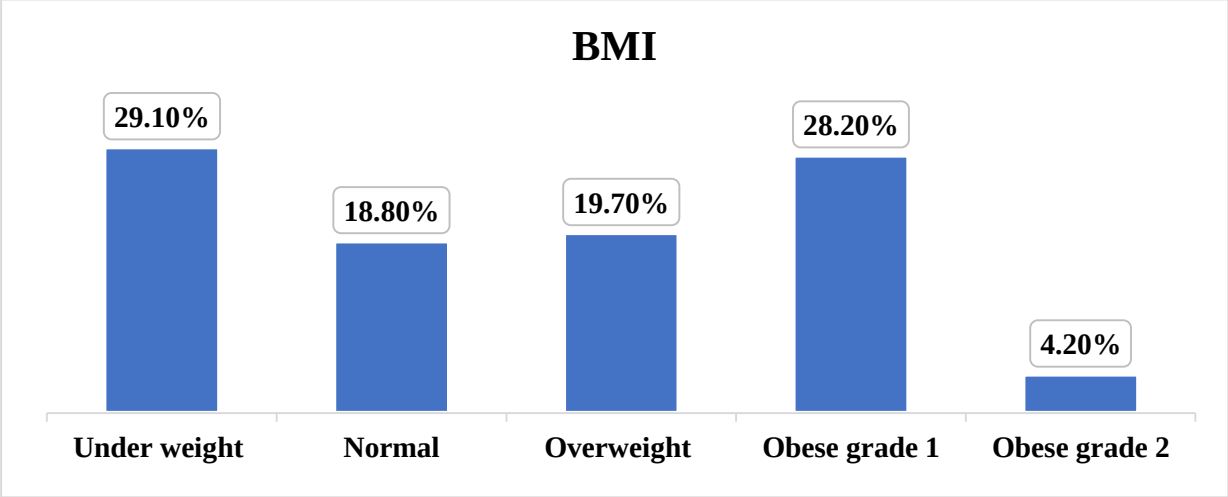

Figure 2: Distribution of Body Mass Index (BMI) Categories Among Study Participants (N = 213)

Table 2 displays the distribution of daily screen time (from Digital Well-being/Screen Time data), degree of neck curvature (craniovertebral angle, CVA), and Neck Disability Index (NDI) levels among participants.

Table 2: Distribution of Screen Time, Degree of Neck Curvature, and Severity of Neck Pain Among the Study Sample (N = 213)

	Study sample (N=213)	
	No	%
Screen time assessment (Per day)		
• 5	33	15.5
• 6	29	13.6
• 7	35	16.4
• 8	54	25.4
• 9	62	29.1
Degree of neck curvature		
• 30	10	4.7
• 35	4	1.9
• 40	57	26.8
• 45	18	8.5
• 50	60	28.2
• 55	44	20.7
• 60	20	9.4

Daily screen time varied considerably, with the most common duration being 9 hours per day, reported by 62 participants (29.1%). This was followed by 8 hours per day (n = 54, 25.4%), 7 hours (n = 35, 16.4%), 5 hours (n = 33, 15.5%), and 6 hours (n = 29, 13.6%). Collectively, 54.5% of participants (n = 116) reported screen time of 8 hours or more per day, indicating a very high level of digital device exposure among this student population.

The craniovertebral angle (CVA) was measured using a universal goniometer as described in the methodology. Lower CVA values indicate greater forward head posture (FHP). The highest proportion of participants exhibited a CVA of 50° (n = 60, 28.2%), followed by 40° (n = 57, 26.8%), 55° (n = 44, 20.7%), 60° (n = 20, 9.4%), 45° (n = 18, 8.5%), 30° (n = 10, 4.7%), and 35° (n = 4, 1.9%). Notably, more than half of the samples (55.0%) had CVA values ≤ 50°, indicating some degree of forward head posture, while 30.1% had CVA ≤ 40°, representing more pronounced FHP (Figure 3).

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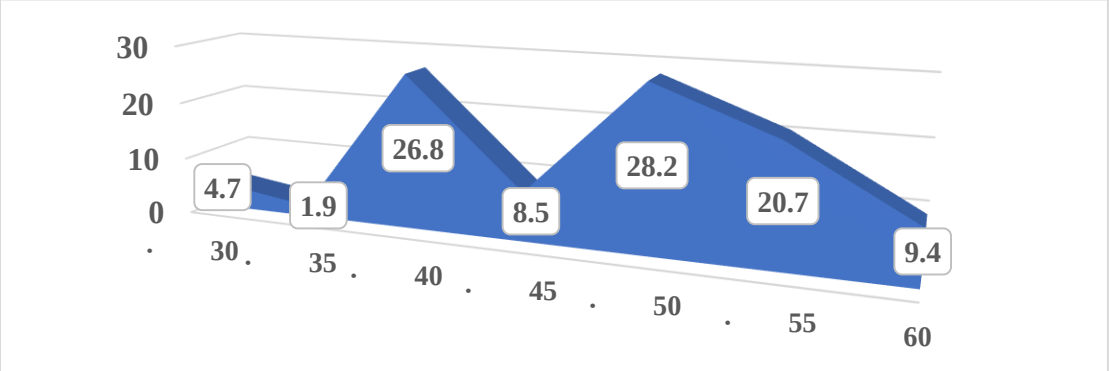

Figure 3: Distribution of Craniovertebral Angle (Neck Curvature) Among Study Participants (N = 213)

Table 3 presents the distribution of NDI levels. The majority of participants (n = 161, 75.6%) reported no disability (NDI score 0–4). Mild disability (NDI 5–14) was observed in 23 participants (10.8%), and moderate disability (NDI 15–24) was observed in 29 participants (13.6%). Notably, no participants fell into the severe disability (25–34) or complete disability (>34) categories. Thus, while approximately one quarter of the sample (24.4%) experienced some degree of neck-related functional limitation, the severity was predominantly mild to moderate (Figure 4).

Table 3: Distribution of Neck Disability Index (NDI) Levels Among Study Participants (N = 213)

Neck Disability Index (NDI) Levels	NDI Score Range	Frequency	Percent (%)
• **No disability**	0-4	161	75.6
• **Mild disability**	5-14	23	10.8
• **Moderate disability**	15-24	29	13.6
• **Severe disability**	25-34	0	0.0
• **Complete disability**	>35	0	0.0

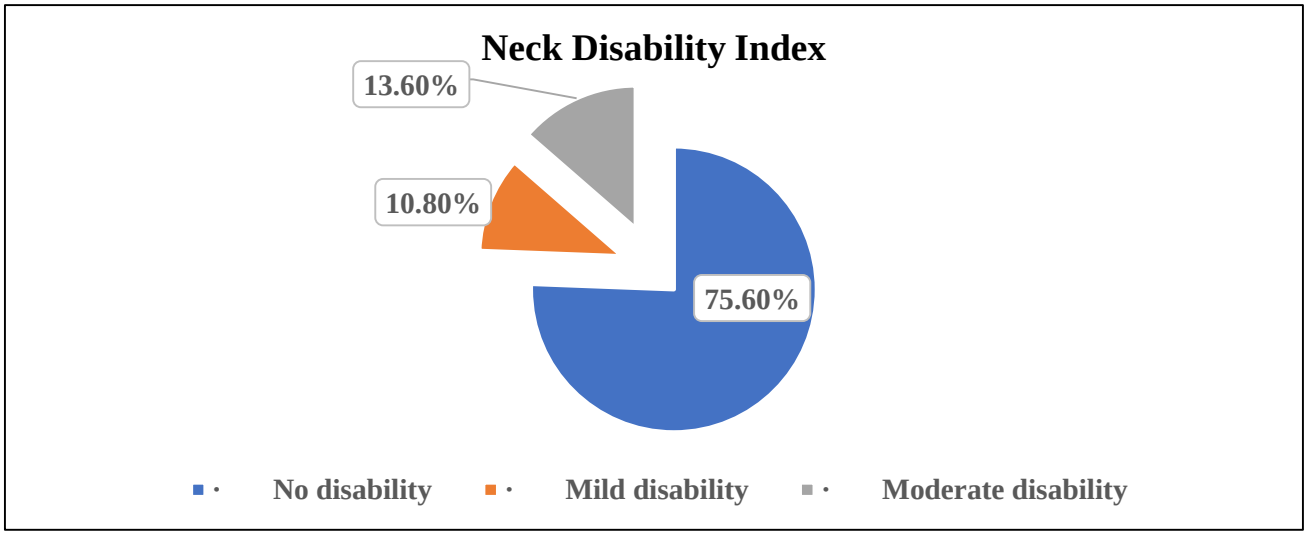

Figure 4: Distribution of Neck Disability Index (NDI) Levels Among Study Participants (N = 213)

Table 4 presents the relationship between demographic characteristics (age, specialty, BMI) and NDI levels using the chi-square test.

A statistically significant association was observed between age and neck disability levels (χ^2 = 11.724, p = 0.020). Participants aged 21–23 years constituted the largest proportion across all NDI categories: no disability (51.6%), mild disability (10.3%), and moderate disability (8.5%). Moderate neck disability was more prevalent among participants aged 23–26 years or older (3.3%) compared with younger age groups. No cases of mild disability were reported among participants aged 18–21 years, suggesting that neck disability increases with advancing age.

A statistically significant relationship was also found between academic specialty and NDI levels ($\chi^2 = 6.425$, $p = 0.040$). Nursing students represented the majority of participants with no disability (50.7%), as well as those with mild (4.7%) and moderate disability (7.0%). Physical therapy students demonstrated higher proportions of mild (6.1%) and moderate (6.6%) neck disability relative to their total number, suggesting that specialty-related academic or clinical demands may influence the degree of neck disability.

Table 4: Relationship Between Demographic Characteristics, and Levels of Neck Disability Index (NDI) Among the Study Sample (N = 213)

Demographic Characteristics	Neck Disability index						Test of sign/ Chi square
	No disability (n=161)		Mild disability (n=23)		Moderate Neck Disability (n=29)		
	No	%	No	%	No	%	
Age							
• 18-21 years	32	15.0	0	0.0	4	1.9	**$\chi2$= 11.724**
• 21-23 years	110	51.6	22	10.3	18	8.5	**P=0.020***
• 23-26 or more	19	8.9	1	0.5	7	3.3	
Specialty							
• Nursing	108	50.7	10	4.7	15	7.0	**$\chi2$= 6.425**
• Physical therapy	53	24.9	13	6.1	14	6.6	**P= 0.040***
BMI (Weight/ Hight^2)							
• Underweight (less than 18.5)	40	18.8	12	5.6	10	4.7	**$\chi2$= 20.015**
• Normal weight (18.5 to 24.9)	33	15.5	1	0.5	6	2.8	**P= 0.010***
• Overweight (25to 29.9)	34	16.0	0	0.0	8	3.8	
• Obese (30-34.9)	45	21.1	10	4.7	5	2.3	
• Obese grade 2 (35.0or more)	9	4.2	0	0.0	0	0.0	

Table 5 illustrates the relationship between daily screen time (hours/day) and NDI levels. The analysis revealed a highly statistically significant association ($\chi^2 = 27.144$, $p = 0.001$).

Among participants with no neck disability, the largest proportions were those with 9 hours (24.9%), 8 hours (17.4%), and 7 hours (14.1%) of daily screen time. Among those with mild disability, participants with 8 hours (4.7%) and 5 hours (4.2%) were most common. For moderate disability, the highest proportions were observed among participants with 9 hours (4.2%) and 8 hours (3.3%). No cases of mild disability were observed among participants reporting 7 or 9 hours of screen use per day. Overall, longer daily screen time was associated with higher levels of neck disability, though the pattern was not strictly linear.

Table 5: Relationship Between Daily Screen Time and Levels of Neck Disability Index (NDI) (N = 213)

Screen time assessment	Neck Disability index						Test of sign/ Chi square
	No disability (n=161)		Mild disability (n=23)		Moderate Neck Disability (n=29)		
	No	%	No	%	No	%	
Screen time assessment (per day)							
• 5	18	8.5	9	4.2	6	2.8	
• 6	23	10.8	4	1.9	2	0.9	**$\chi2$= 27.144**
• 7	30	14.1	0	0.0	5	2.3	**P=0.001***
• 8	37	17.4	10	4.7	7	3.3	
• 9	53	24.9	0	0.0	9	4.2	

Table 6 presents the relationship between craniovertebral angles (CVA) during phone use and NDI levels. Statistical analysis showed no significant association ($\chi^2 = 19.683$, $p = 0.073$), although a trend was observed.

Participants with no neck disability were most commonly observed at CVA of 50° (20.7%) and 40° (20.2%), followed by 55° (14.6%) and 60° (6.6%). Among participants with mild neck disability, cases were observed only at CVA of 40° (4.7%), 50° (3.8%), and 55° (2.3%). For moderate neck disability, the highest proportions were identified at CVA of 50° (3.8%) and 55° (3.8%), followed by 60° (2.8%) and 40° (1.9%). Although higher head flexion angles (lower CVA) were associated with a greater number of participants reporting mild and moderate neck disability, the observed differences did not reach statistical significance.

Table 6: Relationship Between Craniovertebral Angle (CVA) and Levels of Neck Disability Index (NDI) (N = 213)

Postural Behavior Assessment	Neck Disability index						Test of sign/ Chi square
	No disability (n=161)		Mild disability (n=23)		Moderate Neck Disability(n=29)		
	No	%	No	%	No	%	
Head angle during phone use							
30	8	3.8	0	0.0	2	0.9	
35	3	1.4	0	0.0	1	0.5	
40	43	20.2	10	4.7	4	1.9	$\chi 2$= 19.683
45	18	8.5	0	0.0	0	0.0	P= 0.073
50	44	20.7	8	3.8	8	3.8	
55	31	14.6	5	2.3	8	3.8	
60	14	6.6	0	0.0	6	2.8	

Table 7 presents the Pearson correlation matrix examining the relationships among daily screen time, craniovertebral angle (CVA), and severity of neck pain (VAS).

The analysis showed a weak positive correlation between screen time per day and CVA ($r = 0.131$, $p = 0.056$), indicating that increased screen time tended to be associated with slightly larger CVA (i.e., less forward head posture), but this relationship did not reach statistical significance. Regarding the relationship between screen time per day and VAS pain severity, a weak negative correlation was observed ($r = -0.100$, $p = 0.146$), which was also not statistically significant, suggesting that screen time alone was not directly related to reported neck pain intensity. Additionally, the correlation between CVA and VAS was weakly positive ($r = 0.106$, $p = 0.124$) and not statistically significant, indicating that increased neck flexion angle (lower CVA) was not independently associated with higher pain levels

Table 7: Pearson Correlation Matrix Between Screen Time, CVA, and VAS (N = 213)

Correlations Matrix				
		Screen time per day	Degree in neck curvature	Severity of Neck Pain
Screen time per day	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	213		
Degree of neck curvature	Pearson Correlation	.131		
	Sig. (2-tailed)	.056		
	N	213	213	
Severity of Neck Pain	Pearson Correlation	-.100	.106	
	Sig. (2-tailed)	.146	.124	
	N	213	213	213

Table 8 presents the results of the multiple linear regression analysis conducted to identify independent predictors of neck disability (NDI score). The dependent variable was the NDI total score (continuous). Independent variables entered into the model were: age, gender, BMI, daily screen time, craniovertebral angle (CVA), and VAS pain score.

The regression model yielded a constant term that was statistically significant ($B = 1.811$, $t = 3.542$, $p = 0.000$), indicating a baseline level of neck disability independent of the studied predictors. However, none of the independent variables demonstrated a statistically significant association with neck disability at the 0.05 level in the adjusted model.

Table 8: Linear Regression Analysis Identifying Predictors of Neck Disability (N = 213)

Predictor Variable	B	Std. Error	Beta	t	P value
Constant	1.811	0.511	—	3.542	**0.000***
• Specialty	0.052	0.130	0.036	0.402	0.688
• Age	0.070	0.111	0.053	0.630	0.530
• BMI	0.096	0.084	0.172	1.136	0.257
• Screen time assessment (per day)	-0.043	0.039	-0.085	-1.096	0.274
• Degree of neck curvature	0.004	0.009	0.041	0.439	0.661

The majority of participants reported no neck disability (75.6%), while 10.8% experienced mild disability and 13.6% moderate disability, with no cases of severe or complete disability identified. More than half of the sample (54.5%) reported daily screen use of 8 hours or more. Regarding posture, 55% of participants demonstrated a craniovertebral angle (CVA) ≤ 50°, indicating some degree of forward head posture, and 30.1% exhibited a CVA ≤ 40°, reflecting a more pronounced deviation. Bivariate analysis showed that age, academic specialty, BMI, and daily screen time were significantly associated with neck disability ($p < 0.05$).

However, posture alone was not significantly associated with Neck Disability Index (NDI) levels ($p = 0.073$). Additionally, only weak and non-significant correlations were found between screen time, CVA, and pain intensity (VAS). In multivariate regression analysis, none of the studied variables emerged as independent predictors of neck disability after adjustment, suggesting that neck disability is influenced by a complex interplay of factors rather than a single dominant contributor.

4. DISCUSSION

The present cross-sectional study investigated the relationships between screen time, forward head posture, neck pain intensity, and neck disability among health college students at Buraydah Colleges. The findings revealed that 24.4% of participants experienced mild-to-moderate neck disability, with no cases of severe disability identified. Prolonged screen exposure was highly prevalent, as more than half of the participants reported daily screen use of eight hours or more. Similarly, forward head posture was common, with 55% of participants demonstrating craniovertebral angle (CVA) values ≤ 50°. Significant associations were observed between neck disability and age, BMI, academic specialty, and screen time in the bivariate analysis. However, no statistically significant relationship was found between CVA and neck disability, and none of the studied variables independently predicted neck disability in the regression model. These findings suggest that neck disability among university students is multifactorial, influenced by an interaction of behavioral, physical, and psychosocial factors.

The prevalence of neck disability observed in this study was lower than that reported in several previous investigations among university students. Only 24.4% of participants showed mild-to-moderate disability, with no cases of severe disability. In contrast, Almutairi et al. reported that 79.5% of university students experienced neck pain, with a considerable proportion showing mild and moderate disability. Similarly, other studies have reported that approximately 48.3% of college students experience varying degrees of neck-related disability. The lower prevalence in the present study may be attributed to the inclusion of health college students-particularly those in Nursing and Physical Therapy programs-who may have greater awareness of posture, ergonomics, and musculoskeletal health. Additionally, the Neck Disability Index assesses functional limitation rather than pain alone, meaning some participants may have experienced discomfort without clinically significant disability **(Almutairi et al., 2024b).**

Daily screen time was significantly associated with neck disability in bivariate analysis, indicating that students with prolonged screen exposure tended to report higher disability levels. More than half of participants reported using digital devices for eight hours or more daily. These findings are consistent with previous literature. Alzahrani et al. found that smartphone use exceeding seven hours per day was significantly associated with neck disability among Saudi university students. Likewise, Yılmaz and Göz reported significantly higher frequencies of severe neck disability among students using devices for seven hours or more. Additionally, James et al. identified a positive correlation between smartphone use duration and NDI scores. Together, these findings reinforce growing evidence that prolonged digital device use contributes to musculoskeletal symptoms and functional limitations **(Yılmaz & Göz, 2023).**

Despite this association, screen time did not independently predict neck disability in the multivariate regression model. This suggests that the relationship is likely influenced by confounding factors such as BMI, age, physical activity, stress, sleep quality, and ergonomic behaviors. Previous research similarly emphasizes the multifactorial nature of musculoskeletal symptoms related to smartphone use. Factors such as prolonged sedentary behavior, poor posture, and psychological stress have been shown to collectively contribute to pain and disability among students. Moreover, psychosocial variables—including stress, anxiety, and sleep disturbances—are increasingly recognized as important contributors to neck pain and disability **(Samuel et al., 2023a; Samuel et al., 2023b).**

Forward head posture was highly prevalent, with over half of participants demonstrating CVA values ≤ 50°. However, no statistically significant relationship was found between CVA and neck disability. Although a trend toward greater disability with lower CVA values was observed, it did not reach statistical significance. This may be explained by several factors. First, the majority of participants had no or only mild disability, limiting variability in NDI scores. Second, CVA represents a static measurement, while neck disability often results from prolonged dynamic postural behaviors. Third, clinically significant disability may occur primarily in cases of severe postural deviation, which were limited in this sample **(Jutt et al., 2026).**

Previous studies have reported inconsistent findings regarding the relationship between forward head posture and neck disability. Some research has demonstrated strong associations between reduced CVA and increased smartphone use, supporting the concept of "text neck." However, other studies suggest that posture alone does not directly predict pain or disability after adjusting for additional factors such as physical activity and psychological stress. Therefore, the findings of the current study support the idea that forward head posture may contribute to neck dysfunction but is unlikely to be an independent predictor of disability **(Menaria et al., 2022).**

Body mass index was significantly associated with neck disability, with both underweight and obese participants demonstrating higher disability levels. This suggests that extremes of body weight may negatively affect cervical musculoskeletal health. Increased body mass may elevate mechanical loading on the cervical spine, while underweight individuals may have reduced muscle strength and postural stability. Age was also significantly associated with disability, with older students reporting higher levels of moderate disability, potentially reflecting cumulative exposure to prolonged screen use and postural stress over time **(Güneş et al., 2025).**

Academic specialty was another significant factor, with Physical Therapy students showing higher levels of mild and moderate disability compared to Nursing students. This may reflect increased awareness of musculoskeletal symptoms or differences in academic and clinical demands, including prolonged standing and repetitive postural activities **(Aljinović et al., 2023).**

Correlation analysis revealed weak and non-significant relationships between screen time, CVA, and pain intensity, suggesting that these variables may not independently explain neck disability. Similar findings have been reported in previous studies, highlighting that musculoskeletal symptom arise from complex interactions among behavioral and physical factors **(Chhetri et al., 2025).**

Importantly, none of the variables independently predicted neck disability in the regression model, reinforcing the multifactorial nature of the condition. Factors not assessed in this study such as stress, sleep quality, physical activity, ergonomics, and previous injury may play a significant role. Future research should adopt a comprehensive biopsychosocial approach to better understand neck disability in student populations.

This study has several limitations. The cross-sectional design precludes causal inference. Additionally, while objective screen time data were used, other relevant factors such as physical activity, ergonomics, stress, and sleep were not assessed. Gender was also not included in the regression model, despite its known association with neck pain. Future longitudinal studies with larger and more diverse samples are recommended to further clarify the mechanisms underlying neck disability in university students.

5. CONCLUSION

This cross-sectional study investigated the relationships between screen time, forward head posture, neck pain intensity, and neck disability among 213 health college students at Buraydah Colleges. The findings showed that approximately 24.4% of participants experienced mild-to-moderate neck disability, with no cases of severe or complete disability, indicating that although neck-related problems exist, they are generally not disabling. High screen exposure and postural deviations were

common, with more than half of the students (54.5%) reporting daily screen use of eight hours or more and 55% demonstrating forward head posture (craniovertebral angle ≤ 50°), reflecting a considerable ergonomic risk.

Bivariate analysis revealed significant associations between neck disability and age, academic specialty, body mass index (BMI), and screen time, while no significant association was found with craniovertebral angle.

Furthermore, multivariate regression analysis demonstrated that none of the studied variables independently predicted neck disability, explaining only a small proportion of the variance, which highlights the multifactorial nature of the condition. The lack of a significant independent effect of posture suggests that static measures such as CVA may not fully capture the dynamic and cumulative postural behaviors contributing to disability.

Overall, these findings indicate that neck disability among health students is influenced by a complex interplay of demographic, behavioral, and physical factors rather than a single determinant. Accordingly, comprehensive interventions addressing screen use, ergonomics, physical activity, stress, and sleep are recommended to reduce the burden of neck-related problems in this population.

6. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed:

- Universities should implement educational programs to increase students' awareness of proper posture, especially during prolonged use of digital devices.
- Limiting daily screen use, particularly for non-academic purposes, may help minimize the risk of developing neck pain and disability.
- Universities should develop comprehensive health strategies addressing not only posture and screen time but also stress management, sleep quality, and overall lifestyle habits.

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