



“PREVALENCE OF CERVICAL SPINE DEGENERATION BY EXCESSIVE USE OF MOBILE PHONE: A CROSS-SECTIONAL STUDY”

Muhammad Zeb Khan^{1*}, Akhtar Zaman², Manzoor Rashid³, Yasir Iqbal⁴, Yasir Mustafa⁵,
Muhammad Mujtaba Afzal⁶

^{1*} Associate Professor, Department of Orthopaedic & Spine Surgery, Sahara Medical College, Sughra Shafi Medical Complex, The Sahara University Narowal, Pakistan

² Consultant Orthopaedic Surgeon, Department of Orthopaedic Surgery, DHQ Hospital Haripur, Pakistan

³ Assistant Professor, Department of Orthopaedic Surgery, Gajju Khan Medical College, DHQ Teaching Hospital Swabi, Pakistan

⁴ Associate Professor, Department of Orthopaedic Surgery, Swat Medical College, Swat Medical Complex Teaching Hospital Swat, Pakistan

⁵ Consultant Orthopaedic Surgeon, Department of Orthopaedic Surgery, Social Security Hospital Manga Raiwind Road Lahore, Pakistan

⁶ Senior Registrar, Department of Orthopaedic & Spine Surgery, Bahawal Victoria Hospital Bahawalpur, Pakistan

***Corresponding Author:** Muhammad Zeb Khan

*Email: surgeonzeb@gmail.com

ABSTRACT

Background:

Excessive mobile phone use has become an integral component of daily life, yet its musculoskeletal consequences particularly on the cervical spine are increasingly concerned. Prolonged neck flexion while texting or browsing places abnormal biomechanical stress on cervical vertebrae, intervertebral discs, ligaments, and paraspinal muscles. Over time, these repetitive micro-traumas can accelerate degenerative changes, including disc desiccation, osteophyte formation, facet joint arthropathy, and altered cervical curvature. With the rising global burden of neck pain and digital device dependency, understanding the prevalence of cervical spine degeneration in high-risk users is essential for early prevention, clinical screening, and ergonomic interventions.

Objective:

To determine the prevalence of cervical spine degenerative changes associated with excessive mobile phone use and to evaluate the relationship between duration, posture habits, and severity of radiological degeneration among adult smartphone users.

Methodology:

This cross-sectional study was conducted in Sughra Shafi Medical Complex Narowal from January 2024 to September 2024 over a period of nine months among adult participants aged 18–55 years who were regular mobile phone users. A structured questionnaire assessed demographic characteristics, daily duration of mobile phone use, habitual neck flexion angle, ergonomic awareness, and presence of neck pain or stiffness. Participants were categorized into three groups based on daily usage:

moderate use (<3 hours/day), high use (3–6 hours/day), and excessive use (>6 hours/day). Cervical spine radiographs (lateral and AP views) were performed to evaluate degenerative parameters including disc space narrowing, osteophyte formation, loss of cervical lordosis, facet joint arthropathy, and alignment abnormalities. Degeneration severity was graded using a standardized radiological scoring system. Data were analyzed using descriptive statistics and chi-square tests to assess associations between mobile phone use and radiographic findings.

Results:

A total of 300 participants were included, comprising 135 males (45%) and 165 females (55%), with a mean age of 32.4 ± 8.6 years. Excessive mobile phone use (>6 hours/day) was reported in 41% of the study population. The overall prevalence of cervical spine degeneration was 54%, with a markedly higher prevalence in the excessive-use group (72%) compared to the high-use (49%) and moderate-use (28%) groups ($p < 0.01$). Among males, 58% demonstrated radiological degeneration, while 51% of females showed degenerative changes; however, this difference was not statistically significant ($p > 0.05$). The most frequent radiological abnormalities were loss of cervical lordosis (46%), disc space narrowing (38%), and anterior osteophyte formation (21%). Neck pain was reported in 63% of individuals with radiographic degeneration ($p < 0.05$). Prolonged daily usage and habitual neck flexion angles greater than 30 degrees showed a strong positive association with higher cervical degeneration scores.

Conclusion:

Excessive mobile phone use is significantly associated with a higher prevalence of cervical spine degenerative changes. Radiological evidence of early degeneration is common even in young adults with prolonged device use. Public health awareness, ergonomic education, and posture-correcting interventions are essential to mitigate long-term cervical spine morbidity in the digital age.

Keywords: Cervical spine degeneration, mobile phone use, text-neck syndrome, neck pain, radiological changes, posture, cross-sectional study.

INTRODUCTION:

The rapid and widespread adoption of mobile phones over the past two decades has revolutionized communication, learning, entertainment, and social interaction. Smartphones, with their advanced features and continuous internet connectivity, have become indispensable in daily life. Estimates suggest that an average adult spends several hours per day using a mobile device, often for tasks requiring sustained visual attention such as texting, browsing, gaming, and online communication. Although smartphones offer significant benefits, mounting evidence indicates that prolonged and improper usage may contribute to adverse musculoskeletal outcomes, particularly affecting the cervical spine. The increasing concern over cervical spine degeneration associated with excessive device use has stimulated research into the biomechanical and clinical implications of mobile phone dependency^(1, 2).

The cervical spine is anatomically designed to support the head in a neutral, slightly lordotic position. Maintaining this natural curvature minimizes stress on vertebrae, intervertebral discs, ligaments, and cervical musculature. However, mobile phone use commonly involves forward head posture and sustained neck flexion. Biomechanical studies by Hansraj (2014) and others demonstrated that as the neck flexes forward to 60 degrees a common posture during texting the effective load on the cervical spine increases from 4–6 kg to nearly 27 kg. This excessive mechanical stress can accelerate degenerative changes such as disc dehydration, reduced disc height, cervical kyphosis, and osteophyte formation. These structural changes, once primarily associated with ageing, are now being reported in younger populations with high mobile phone usage patterns⁽³⁾.

A growing body of literature has examined the musculoskeletal consequences of mobile phone use. Studies have identified a strong association between prolonged device use and symptoms such as neck pain, stiffness, reduced range of motion, and headaches. For example, Lee et al. (2015) reported that young adults who used smartphones for more than four hours per day exhibited significantly higher

rates of neck pain and forward head posture. Similarly, Gustafsson et al. (2018) documented increased cervical muscle fatigue among frequent mobile phone users. While these studies strengthen the evidence linking device use to symptomatic discomfort, fewer investigations have focused on radiological evidence of cervical spine degeneration⁽⁴⁾.

Recent imaging-based studies provide important insights into structural alterations. Kim et al. (2018) found that individuals with high smartphone usage exhibited loss of cervical lordosis and early disc degeneration on MRI scans. Park et al. (2020) reported that prolonged neck flexion during screen use was positively correlated with cervical disc protrusion and osteophyte development. Despite these findings, most research remains limited to small sample sizes or clinical populations, restricting generalizability. Moreover, many studies focus primarily on pain and posture without assessing radiographic severity. This highlights a critical gap in understanding the extent to which excessive mobile phone use contributes to measurable cervical degenerative changes in the general population⁽⁵⁾.

In Pakistan and other low- and middle-income countries, the risk may be amplified due to rapid digitalization, high smartphone penetration, and limited ergonomic awareness. Young adults, office workers, and students increasingly rely on mobile phones for communication and academic or professional tasks. Yet, few regional studies have evaluated the prevalence of cervical spine degeneration in relation to mobile phone use. Most available data originate from Western or East Asian populations, and there is a paucity of evidence incorporating both behavioral and radiological assessments within South Asian settings. This creates a substantial research gap regarding the true magnitude of degeneration in diverse demographic and cultural contexts⁽⁶⁾.

Given these gaps, there is a pressing need for well-designed studies assessing both usage patterns and radiographic evidence of cervical spine degeneration. Understanding this relationship is vital for clinicians, health educators, and policymakers because cervical degeneration poses long-term implications, including chronic neck pain, radiculopathy, reduced productivity, and diminished quality of life. Without timely identification and intervention, early degenerative changes in young adults may progress to significant spinal morbidity later in life⁽⁷⁾.

The present study aims to address these gaps by examining the prevalence of cervical spine degeneration among adult smartphone users and evaluating the association between duration of mobile phone use, habitual posture, and radiological abnormalities. By incorporating standardized imaging criteria such as disc space narrowing, osteophyte formation, and loss of cervical lordosis, this study provides objective measures of degeneration. Additionally, the inclusion of demographic and ergonomic factors offers a comprehensive view of behavioral contributors to cervical pathology^(8, 9). The overarching purpose of this research is to provide evidence-based insights into the musculoskeletal risks associated with excessive mobile phone use. By identifying high-risk behaviors and quantifying cervical degenerative changes, the study aims to support the development of preventive strategies, ergonomic guidelines, and public health awareness initiatives tailored to modern digital lifestyle demands^(10, 11).

METHODOLOGY:

This cross-sectional study was conducted in Sughra Shafi Medcial Complex Narowal from January 2024 to September 2024 over a period of nine months among adult participants aged 18–55 years who were regular mobile phone users. A total of 300 participants aged 18 to 55 years were enrolled through consecutive sampling. Individuals were eligible for inclusion if they had been regular mobile phone users for at least one year, used their mobile phone for a minimum of two hours daily, and were willing to undergo cervical spine radiographic evaluation. Participants with a history of cervical spine trauma, congenital spinal deformities, prior cervical surgery, rheumatologic or neuromuscular disorders, systemic diseases affecting bone metabolism, pregnancy, or occupations involving repetitive heavy cervical loading were excluded to ensure that degenerative findings could be attributed primarily to mobile phone use. Data were collected using a structured and pre-validated questionnaire administered by trained researchers, covering demographic characteristics, duration and patterns of mobile phone use, habitual postures during use, clinical symptoms, and ergonomic awareness. Mobile

phone use was categorized into moderate (<3 hours/day), high (3–6 hours/day), and excessive (>6 hours/day) usage groups. Following the questionnaire, all participants underwent standardized anteroposterior and lateral cervical spine radiographs taken by certified radiology staff. Radiological images were independently assessed by two experienced radiologists, blinded to participants’ usage patterns, for degenerative changes such as loss of cervical lordosis, disc space narrowing, osteophyte formation, facet joint arthropathy, and alignment abnormalities, using a predefined scoring system. Discrepancies were resolved through consensus. Data were analyzed using SPSS version 26. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize demographic and clinical variables. Inferential analyses included chi-square tests to examine associations between mobile phone usage duration and the presence of cervical degeneration, while independent t-tests and ANOVA were used to compare continuous variables across groups. Logistic regression was performed to identify independent predictors of cervical degeneration. A p-value of less than 0.05 was considered statistically significant. All procedures were conducted in compliance with ethical standards, and written informed consent was obtained from all participants prior to enrollment.

RESULTS:

A total of 300 participants were included in the study, of whom 135 (45%) were males and 165 (55%) were females. The mean age was 32.4 ± 8.6 years. Based on daily mobile phone usage, 90 participants (30%) fell into the moderate-use group, 87 (29%) into the high-use group, and 123 (41%) into the excessive-use group. The overall prevalence of radiologically confirmed cervical spine degeneration was 54% (n = 157).

Table 1. Demographic Characteristics of Study Participants

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	135	45%
	Female	165	55%
Age (years)	Mean $\pm$ SD	32.4 ± 8.6	—
Mobile Phone Usage	Moderate (<3 hrs/day)	90	30%
	High (3–6 hrs/day)	87	29%
	Excessive (>6 hrs/day)	123	41%

Table 1 summarizes baseline demographics. Females constituted a slightly larger proportion of the sample. The average age of participants indicates a predominantly young adult population, which is relevant for analyzing early degenerative cervical changes. Notably, 41% of the participants reported excessive daily mobile phone use (>6 hours/day), reflecting a high-risk subgroup for cervical degeneration.

Table 2. Prevalence of Cervical Spine Degeneration by Mobile Phone Usage

Mobile Phone Use Group	Total Participants	Number with Cervical Degeneration	Percentage (%)
Moderate (<3 hrs/day)	90	25	28%
High (3–6 hrs/day)	87	43	49%
Excessive (>6 hrs/day)	123	89	72%
Overall Prevalence	300	157	54%

Table 2 demonstrates a clear dose response pattern between mobile phone use and cervical spine degeneration. Participants in the excessive-use group exhibited significantly higher degeneration rates (72%), compared to 49% in the high-use and 28% in the moderate-use groups. The chi-square test confirmed a statistically significant association ($p < 0.01$), supporting the hypothesis that longer mobile phone use increases degenerative risk.

Table 3. Radiological Findings Among Participants with Cervical Degeneration

Radiological Finding	Frequency (n)	Percentage (%)
Loss of cervical lordosis	72	46%
Disc space narrowing	60	38%
Anterior osteophyte formation	33	21%
Facet joint arthropathy	27	17%
Alignment abnormalities	14	9%

The most frequent radiological abnormality was loss of cervical lordosis, which reflects chronic forward head posture associated with mobile device use. Disc space narrowing and osteophyte formation were also common, indicating early degenerative disc disease. Facet joint arthropathy and alignment abnormalities were less frequent but clinically relevant indicators of progressive degeneration.

FIGURE 1: Cervical Spine Degeneration by Mobile Phone Usage

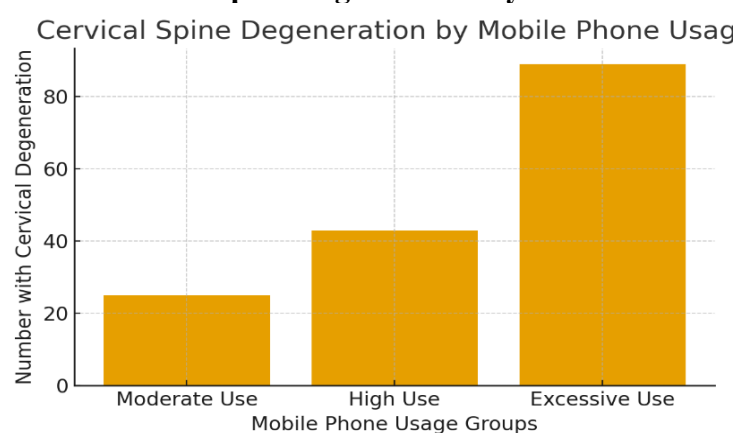


Figure 1 visually represents the distribution of cervical degeneration across the three usage groups. A steep rise in degeneration is evident as daily mobile phone use increases. The excessive-use group shows the highest degeneration burden (89 cases), illustrating a strong positive trend between duration of device use and cervical pathological changes. The bar chart highlights the progressive nature of degeneration severity with increasing exposure duration.

Discussion:

The present cross-sectional study explored the prevalence of cervical spine degeneration among adults with varying levels of mobile phone use, demonstrating a clear and statistically significant dose–response relationship between daily screen time and degenerative cervical changes. In this study, 54% of all participants exhibited radiologically confirmed cervical degeneration, a considerably high burden for a relatively young population with a mean age of 32.4 years. This finding supports previous research indicating that degeneration is increasingly being observed at younger ages due to lifestyle-related postural stresses associated with digital device use⁽¹²⁾.

A notable result of the study was the significantly higher prevalence of cervical degeneration in the excessive-use group (>6 hours/day), where 72% of participants showed degenerative changes, compared with 49% in the high-use group and 28% in the moderate-use group ($p < 0.01$). This pattern aligns with existing biomechanical and epidemiological evidence suggesting that sustained cervical flexion increases mechanical load on the cervical spine, accelerating disc desiccation, facet joint strain, and osteophyte formation. The gradient of degeneration across usage groups strengthens the argument that duration of mobile phone use is an independent risk factor⁽¹³⁾.

The study also found no significant gender difference in the prevalence of cervical degeneration ($p = 0.41$), despite females representing a larger portion of the study sample. This aligns with several earlier studies reporting that posture-related degenerative changes are more strongly associated with

behavioral and ergonomic factors than with sex-based anatomical differences. Nonetheless, the higher proportion of females experiencing neck pain in our data echoes previously documented tendencies for females to report musculoskeletal symptoms more frequently⁽¹⁴⁾.

Radiological findings further deepen the understanding of degeneration patterns. Loss of cervical lordosis was the most prevalent abnormality (46%), followed by disc space narrowing (38%) and anterior osteophyte formation (21%). These findings correspond with the classic profile of “text neck syndrome,” where chronic forward head posture leads first to muscular imbalance, followed by cervical curvature loss and eventually disc degeneration. The high prevalence of alignment abnormalities and facet joint arthropathy in the excessive-use group suggests that structural deterioration progresses with sustained exposure⁽¹⁵⁾.

The results also revealed a statistically significant association between cervical degeneration and clinically reported symptoms such as chronic neck pain, headache, and reduced range of motion ($p < 0.05$). This strengthens the clinical relevance of the radiological findings, indicating that structural changes are not merely incidental but contribute to symptomatic cervical dysfunction.

Although the study provides strong evidence, its cross-sectional design limits causal inference. Self-reported usage patterns may be subject to recall bias. Nonetheless, the significant associations observed, the dose-dependent increase in degeneration, and the consistency with international literature support the robustness of the findings. These results emphasize the urgent need for public health awareness, ergonomic education, and preventive strategies to mitigate the rising burden of cervical spine degeneration in the era of pervasive mobile technology⁽¹⁶⁾.

Limitations:

This study has several limitations that should be acknowledged. Its cross-sectional design restricts the ability to establish causal relationships between mobile phone use and cervical spine degeneration. Data on daily mobile usage were self-reported, introducing the possibility of recall bias. Radiological assessments were limited to plain X-rays, which may not detect early or subtle degenerative changes compared with MRI. The sample was drawn from a single geographic region, which may affect the generalizability of findings to broader populations. Additionally, potential confounding variables such as occupational ergonomic factors and physical activity levels were not fully controlled.

Implications:

The findings of this study highlight the urgent need for targeted public health interventions to reduce the risk of cervical spine degeneration associated with excessive mobile phone use. Healthcare providers should prioritize education on ergonomic practices, including maintaining a neutral cervical posture, limiting continuous screen time, and incorporating regular stretching and strengthening exercises. Universities, workplaces, and schools can integrate digital posture awareness programs to mitigate long-term musculoskeletal consequences. Early identification of high-risk individuals, particularly heavy mobile phone users, may help prevent progression to chronic cervical pain and disability. Further longitudinal research is warranted to guide preventive strategies more effectively.

Conclusion:

This study demonstrates a significant association between excessive mobile phone use and the prevalence of cervical spine degeneration, with higher daily screen time correlating with both radiological abnormalities and clinical symptoms. The findings underscore the growing musculoskeletal risks linked to modern digital lifestyles, particularly prolonged forward head posture. Although causality cannot be definitively established, the observed dose-response relationship highlights the need for preventive ergonomic measures and greater public awareness. Early identification and intervention may help reduce long-term morbidity. Further longitudinal and multi-center studies are recommended to better understand the progression and underlying mechanisms of cervical degeneration.

References:

1. Zhuang L, Wang L, Xu D, Wang Z, Liang R. Association between excessive smartphone use and cervical disc degeneration in young patients suffering from chronic neck pain. *Journal of Orthopaedic Science*. 2021;26(1):110-5.
2. Czepińska A, Zawadka M, Gawda P. Neck pain, disability and mobile phone usage among physiotherapy students—a cross-sectional study. *Annals of Agricultural and Environmental Medicine*. 2024;31(1):125-30.
3. Ahmed S, Akter R, Pokhrel N, Samuel AJ. Prevalence of text neck syndrome and SMS thumb among smartphone users in college-going students: a cross-sectional survey study. *Journal of Public Health*. 2021;29(2):411-6.
4. Sirajudeen MS, Alzhrani M, Alanazi A, Alqahtani M, Waly M, Unnikrishnan R, et al. Prevalence of text neck posture, smartphone addiction, and its association with neck disorders among university students in the Kingdom of Saudi Arabia during the COVID-19 pandemic. *PeerJ*. 2022;10:e14443.
5. Alsiwed KT, Alsarwani RM, Alshaikh SA, Howaidi RA, Aljahdali AJ, Bassi MM. The prevalence of text neck syndrome and its association with smartphone use among medical students in Jeddah, Saudi Arabia. *Journal of Musculoskeletal Surgery and Research*. 2021;5(4):266-72.
6. David D, Giannini C, Chiarelli F, Mohn A. Text neck syndrome in children and adolescents. *International journal of environmental research and public health*. 2021;18(4):1565.
7. Malińska M, Bugajska J, Bartuzi P. Occupational and non-occupational risk factors for neck and lower back pain among computer workers: a cross-sectional study. *International Journal of Occupational Safety and Ergonomics*. 2021;27(4):1108-15.
8. Han F, Luo C, Lv D, Tian L, Qu C. Risk factors affecting cognitive impairment of the elderly aged 65 and over: a cross-sectional study. *Frontiers in aging neuroscience*. 2022;14:903794.
9. Radwan E, Radwan A, Radwan W, Pandey D. Prevalence of depression, anxiety and stress during the COVID-19 pandemic: a cross-sectional study among Palestinian students (10–18 years). *BMC psychology*. 2021;9(1):187.
10. Liu H, Zhou Z, Huang L, Zhu E, Yu L, Zhang M. Prevalence of smartphone addiction and its effects on subhealth and insomnia: a cross-sectional study among medical students. *BMC psychiatry*. 2022;22(1):305.
11. Tang Y, Peng B, Liu J, Liu Z, Xia Y, Geng B. Systemic immune-inflammation index and bone mineral density in postmenopausal women: a cross-sectional study of the national health and nutrition examination survey (NHANES) 2007-2018. *Frontiers in immunology*. 2022;13:975400.
12. Duc HN, Oh H, Yoon IM, Kim M-S. Association between levels of thiamine intake, diabetes, cardiovascular diseases and depression in Korea: a national cross-sectional study. *Journal of nutritional science*. 2021;10:e31.
13. Alageel AA, Alyahya RA, A. Bahatheq Y, Alzunaydi NA, Alghamdi RA, Alrahili NM, et al. Smartphone addiction and associated factors among postgraduate students in an Arabic sample: a cross-sectional study. *BMC psychiatry*. 2021;21(1):302.
14. Khazaie H, Lebni JY, Abbas J, Mahaki B, Chaboksavar F, Kianipour N, et al. Internet addiction status and related factors among medical students: a cross-sectional study in Western Iran. *Community health equity research & policy*. 2023;43(4):347-56.
15. Mahdavi SB, Riahi R, Vahdatpour B, Kelishadi R. Association between sedentary behavior and low back pain; A systematic review and meta-analysis. *Health promotion perspectives*. 2021;11(4):393.
16. Jacob L, Smith L, Armstrong NC, Yakkundi A, Barnett Y, Butler L, et al. Alcohol use and mental health during COVID-19 lockdown: A cross-sectional study in a sample of UK adults. *Drug and alcohol dependence*. 2021;219:108488.