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"Prevalence Of Musculoskeletal Disorders In Medical Students Due To Use Of Smartphone"

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Abstract: ***BACKGROUND & PURPOSE:*** Smartphones have become an integral part of daily life among medical students due to academic and recreational demands. Prolonged and excessive smartphone use is associated with poor posture, repetitive movements, and sustained neck flexion, which may contribute to musculoskeletal disorders (MSDs), particularly affecting the neck and upper extremities. The purpose of this study was to investigate the prevalence of musculoskeletal disorders among medical students due to smartphone use.

***METHODOLOGY*:** A cross-sectional study was conducted on 132 medical students aged 18–25 years at Motiwala College of Physiotherapy using purposive sampling. Outcome measures included the Smartphone Addiction Scale (SAS), Neck Disability Index (NDI), and Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire.

RESULTS: The study revealed a high prevalence of mild neck disability (90.2%), while 75.8% of participants showed no upper limb disability.

CONCLUSION: Excessive smartphone use is strongly associated with neck-related musculoskeletal disorders among medical students, highlighting the need for early preventive and ergonomic interventions.

KEYWORDS: Smartphone use, musculoskeletal disorders, neck disability, medical students, smartphone addiction.

I. INTRODUCTION

The smartphone is one of the most popular and essential gadget among youngsters of today. The ease of access to social media, mobile games, and the internet are all factors in the widespread use and fixation with smartphones.1 The majority of earlier research on musculoskeletal problems was computer-based and focused on students. However, due to their small size, portability, and accessibility, smartphones are used by many students for extended periods of time. Professional college students find smartphones to be an invaluable tool for their academic pursuits, but as a result, they are more likely to use them regularly. Even though everyone is aware of the negative effects of using a smartphone constantly, using a smartphone is something that everyone must do in their everyday lives. 2, 3, 4 The likelihood of developing musculoskeletal pain has increased as a result of the rise in smart phone usage.1 One of the research's highlights is the examination of the connection between musculoskeletal diseases and smartphone addiction.2

With the advancement of mobile technology in today's world, an increasing number of individuals are using handheld gadgets like smartphones, computers, tablets, and e-readers for longer periods of time.3, 5 The majority of smartphone tasks require users to hold their arms out in front of them or to look down sharply at the screen. This causes the user's head to move forward, which puts stress on the cervical spine and neck muscles and causes an excessive anterior curve in the lower cervical vertebrae and an excessive posterior curve in the upper thoracic vertebrae to maintain balance.3, 6 The prolonged, forceful, low amplitude, repeated use of hand-held devices has resulted in an increase in the incidence of musculoskeletal disorders of the hand, wrist, forearm, arm, and neck worldwide.3 There have been few research on the significant rise in teenage smartphone use in recent years, the behavioral impacts it has had, and its link to musculoskeletal discomfort a condition that is becoming more and more of an international issue.3

In addition to being popular phones, smartphones also include a lot of functions like games, social network and internet access, texting, videos, multimedia, and navigation. They can process a lot more data than regular phones. Globally, there are 4.4 billion smartphone users. By the end of 2023, there were 391.6 million smartphone users in India. By the end of 2024, 437 million people in India are expected to be smartphone users. The age range of smartphone users varies, from employees to retirees to students. Concerns about musculoskeletal issues linked to excessive 2 smartphone use have grown in tandem with the rise in smartphone use. According to a Republic of Korea epidemiological survey, 18.8% of smartphone users reported having musculoskeletal complaints in their neck, upper trunk, or upper extremities.7

Awkward posture is one of the physical risk factors linked to musculoskeletal problems of the neck and upper extremities, according to previous research. Long-term smartphone use can lead to bad slouched posture, forward neck posture, and persistent forward neck posture, which can harm ligaments and the cervical and lumbar spine's structural integrity. 7, 8 If a person uses a smartphone for an extended amount of time, the common posture of bending forward and having the neck drooping downward might result in this kind of damage. Many more items have been supplanted by these smartphones and other technology. These devices have access to everything, including social media, entertainment, health information, and academic content. It is challenging to put down smartphones for extended periods of time due of the several utilities that come with using them. Therefore, individuals are using these devices for extended periods of time. However, wearing a neck flexion for extended periods of time is the result of most of the time not adopting the right position. The aforementioned condition is the result of this. The percentage of worldwide health problems related to text neck syndrome is rising.9, 5

The use of smartphones excessively may raise the dangers associated with poor posture, overuse of the muscles, and psychological stress, all of which can result in musculoskeletal problems. There are several ways to evaluate the ergonomic risks associated with utilizing IT equipment.7 Injuries or pain in the human musculoskeletal system, which consists of the joints, ligaments, muscles, tendons, nerves, and structures that support the neck, back, and limbs, are referred to as musculoskeletal diseases. A rapid exertion (carrying a large object, for example) or repetitive strain from performing the same motions, force exposure, vibration exposure, or uncomfortable posture can all lead to musculoskeletal diseases. Exposure can also result from the interplay of ergonomic, psychological, social, and occupational aspects with physical factors.7 While not linked to death, musculoskeletal disorders were shown to be the second largest cause of impairment worldwide according to the Global Burden of Disease (GBD) 2017 report. Neck pain was also linked to discomfort, disability, and a lower quality of life. It has been shown that upper 3 extremities and neck symptoms are common among undergraduate students. There are 48–78% people who report having neck pain.10

According to a recent Indian study, 46.9% of students reported having neck discomfort and 29.2% experienced thumb pain as a result of using their smartphones for extended periods of time. In a different survey, 66.4% of individuals had a smartphone addiction.1 According to Mustafaoglu R et al., a significant proportion of those who are hooked to smartphones experience pain in the dorsum, neck, wrist, and hand.1, 11, 12 According to S. Ahmed et al., college students who are addicted to their smartphones may get thumb and neck pain.1 According to a different survey, 82.38% of respondents said that prolonged smartphone use had caused them to feel uncomfortable in different body areas.1, 13 It has been postulated that these gadgets force the user to hold their neck in one particular position for extended periods of time, straining the neck muscles and causing pain and discomfort in that area.10 The presence of discomfort or chronic pain in the joint, muscles, tendons, and other soft tissues, brought on by or exacerbated by repetitive movement, and prolonged awkward or forced postures are the hallmarks of musculoskeletal injuries.14 Long-term usage of

smartphones is contributing to an increase in the number of new occurrences of minor muscle soreness, Neck as well as upper extremity pain. The thumb and fingers are constantly moving when using smartphones. These components are over-stressed as a result.9, 15

The ubiquitous nature and excessive use of smartphones among university students has raised significant concern, identifying this population as high-risk for developing problematic use or addiction16 This dependence often necessitates long periods of static and repetitive motions in non-ideal postures, which are proven to contribute to the onset of musculoskeletal disorders (MSD). These conditions, characterized by symptoms like fatigue and pain, particularly in the neck the most prevalent site of discomfort reported pose a serious threat to the overall health and academic life of students. For medical students, in particular, the high dual prevalence of smartphone addiction and MSD symptoms highlights a critical public health issue that requires further investigation to mitigate the adverse physical consequences of modern technology use16

The frequent adoption of awkward postures such as reclining on a sofa or sitting prone while using gadgets is a strong predictor for the onset of musculoskeletal symptoms. This pattern 4 of prolonged, defective posture leads to a simultaneous surge in complaints, with a substantial percentage of users reporting discomfort, particularly in the neck, lower back, and shoulders20 Consequently, the excessive and non-ergonomic use of smartphones and other gadgets exposes students to an increased risk of chronic MSDs, which can negatively impact their academic performance and overall quality of life, underscoring the necessity for targeted preventative measures20

The demanding academic environment faced by medical students, combined with the ubiquitous and often prolonged use of smartphones for both study and leisure, has resulted in a significant prevalence of specific musculoskeletal disorders (MSDs)21 The chronic, repetitive forward neck flexion imposes severe stress on the cervical spine, leading to neck pain, stiffness, and disability that can impede crucial daily and academic activities21 The consequence is a cohort of students particularly prone to adverse health outcomes, where the physical symptoms of MSDs can negatively impact their concentration, academic performance, and overall quality of life, underscoring the urgent need to quantify and address this occupational-style hazard within the medical education community21 To effectively quantify the impact of smartphone usage on the health of medical students, it is essential to employ reliable and valid outcome measures for musculoskeletal disorders (MSDs)24 While the primary focus of smartphone-related MSDs often involves the neck and upper extremity, general measures of upper-quadrant disability are invaluable24 Hence the aim of the present study is to investigate the prevalence of musculoskeletal disorders among medical students due to use of smartphones.

AIMS & OBJECTIVES

Aim: The aim of the study is to investigate the prevalence of musculoskeletal disorders among medical students due to use of smartphone.

Objective: To identify the prevalence of musculoskeletal disorders in medical students due to the use of smartphone.

MATERIALS AND METHODOLOGY

A cross-sectional study was conducted over a period of six months at Motiwala College of Physiotherapy to determine the prevalence of musculoskeletal disorders among medical students using smartphones. A total of 132 participants were selected using purposive sampling. Prior to data collection, informed consent was obtained from all participants. Data were collected using an assessment sheet along with standardized outcome measures, including the Smartphone Addiction Scale (SAS), Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire, and the Neck Disability Index (NDI). The materials used for data collection included consent forms, assessment sheets, standardized scales, paper, and pen. Participants of both genders aged 18–25 years, with smartphone usage of more than one hour per day and an SAS score greater than 88, were included in the study. Individuals with a history of recent trauma or surgery to the neck or upper extremity, severe surgical or neurological conditions, or spinal cord injury within the past six months were excluded. The DASH and NDI were used to assess upper limb and neck disability respectively, and the collected data were analyzed to address the research question regarding the prevalence of musculoskeletal disorders associated with smartphone use among medical students.

PROCEDURE

Ethical clearance for the study was obtained from the Institutional Ethical Committee, and prior permission was secured from the management of Motiwala College of Physiotherapy. Participants were recruited using a purposive sampling technique based on predefined inclusion and exclusion criteria. After selection, the nature and purpose of the study were clearly explained to all participants, and both oral and written informed consent were obtained. Data collection was carried out over a period of six months using a screening proforma and structured questionnaires. The collected data included demographic details such as name, age, gender, hand dominance, and average hours of smartphone usage per day, followed by standardized outcome measures namely the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire and the Neck Disability Index (NDI) to assess upper limb and neck-related disability. Following data collection, all responses were entered into a Microsoft Excel sheet, and appropriate statistical analysis was performed to interpret the findings.

DATA ANALYSIS

Data collected from the study participants were carefully entered into Microsoft Excel 2021 and organized into a master chart, with rigorous validation procedures implemented to ensure data accuracy and completeness. The validated data were subsequently imported into the Statistical Package for Social Sciences (SPSS) version 26 for comprehensive statistical analysis. Quantitative variables were summarized using mean and standard deviation, while qualitative variables were expressed as frequencies and percentages. The analyzed data were presented in an organized manner using tables, pie charts, and bar charts to clearly depict the distribution patterns of categorical variables and provide an overall representation of the study findings.

RESULT

This cross-sectional study aimed to investigate the prevalence of musculoskeletal disorders among medical students due to use of smartphone. A total of 132 medical students, aged 18 to 25 years, participated in the study. Participants were recruited using a simple random sampling method. Table 1 shows the frequency distribution of Gender characteristics.

TABLE 1: DEMOGRAPHIC DISTRIBUTION OF GENDER CHARACTERISTICS

Gender	Counts	% of Total
Female	106	80.30%
Male	26	19.70%

Inference: Table 1 shows the frequency distribution of gender, which consists of a total of 132 participants (106 female + 26 male). Specifically, 106 participants, representing 80.30% of the total, are female (F). In contrast, only 26 participants, making up 19.70% of the total, are male

(M). Consequently, the findings of this research will be heavily skewed toward and more representative of the female population, suggesting caution must be exercised when attempting to generalize the results to a broader population or specifically to male subjects.

GRAPH 1: DEMOGRAPHIC DISTRIBUTION OF GENDER CHARACTERISTIC

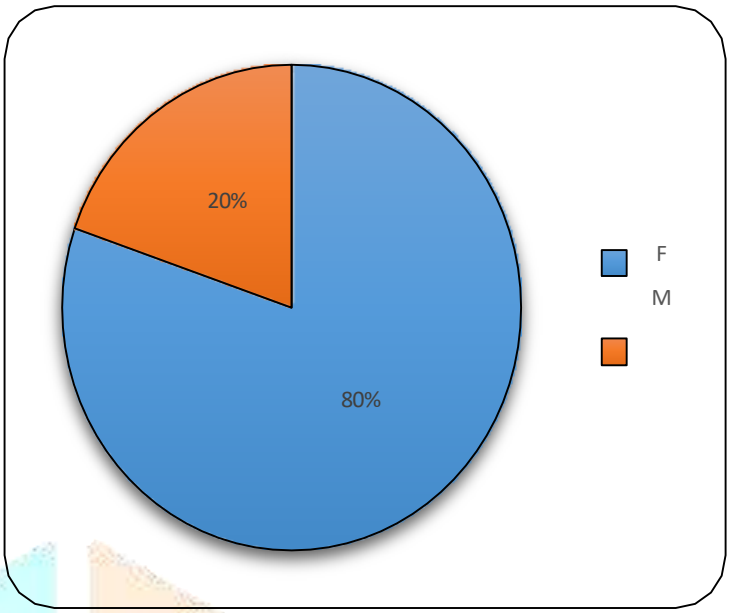


TABLE 2: DEMOGRAPHIC DISTRIBUTION OF DOMINANCE

Dominance	Counts	% of Total
Left	44	33.30%
Right	88	66.70%

Inference: Table 2 showed that the total number of participants in this analysis is 132 (44 Left- Dominant + 88 Right-Dominant). The data reveals that the majority of the participants exhibit Right (R) dominance. Specifically, 88 participants, accounting for 66.70% of the sample, are right-dominant. In contrast, 44 participants, representing 33.30% of the sample, are left- dominant (L). This indicates that two-thirds of the study population is right-dominant, which is generally consistent with the expected distribution of handedness in the general population.

GRAPH 2: DEMOGRAPHIC DISTRIBUTION OF DOMINANCE

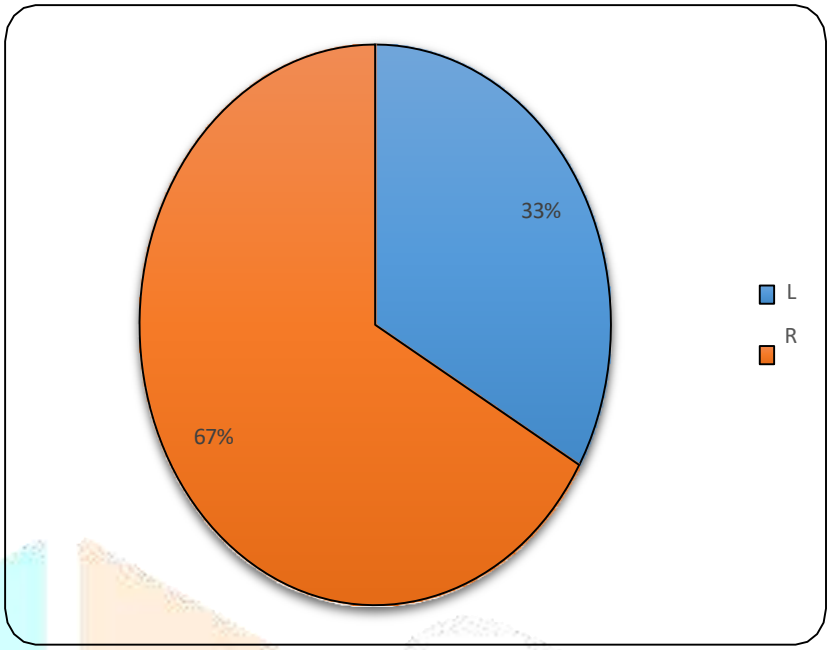


TABLE 3: PREVALENCE OF NDI

NDI Interpretation	Counts	% of Total
Mild Disability	119	90.20%
No Disability	13	9.80%

Inference: Table 3. The analysis includes a total of 132 participants (119 with Mild Disability + 13 with No Disability). The majority of the sample reported some level of neck disability. Specifically, 119 participants, which constitutes 90.20% of the total sample, were classified as having a Mild Disability. Conversely, only 13 participants, or 9.80% of the sample, were classified as having No Disability. This finding suggests that the study population is heavily characterized by individuals experiencing at least a mild functional limitation related to their neck.

GRAPH 3: PREVALENCE OF NDI

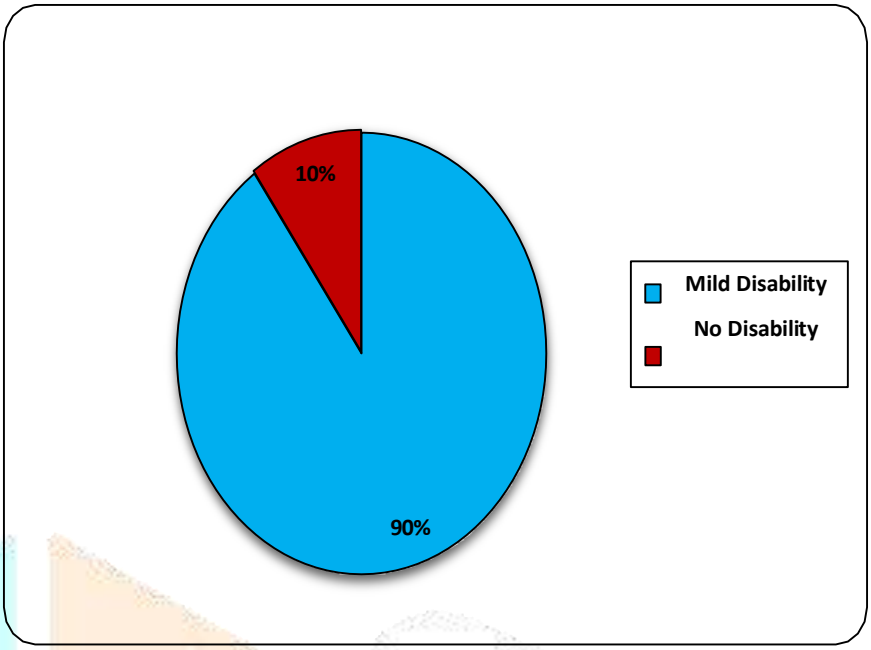
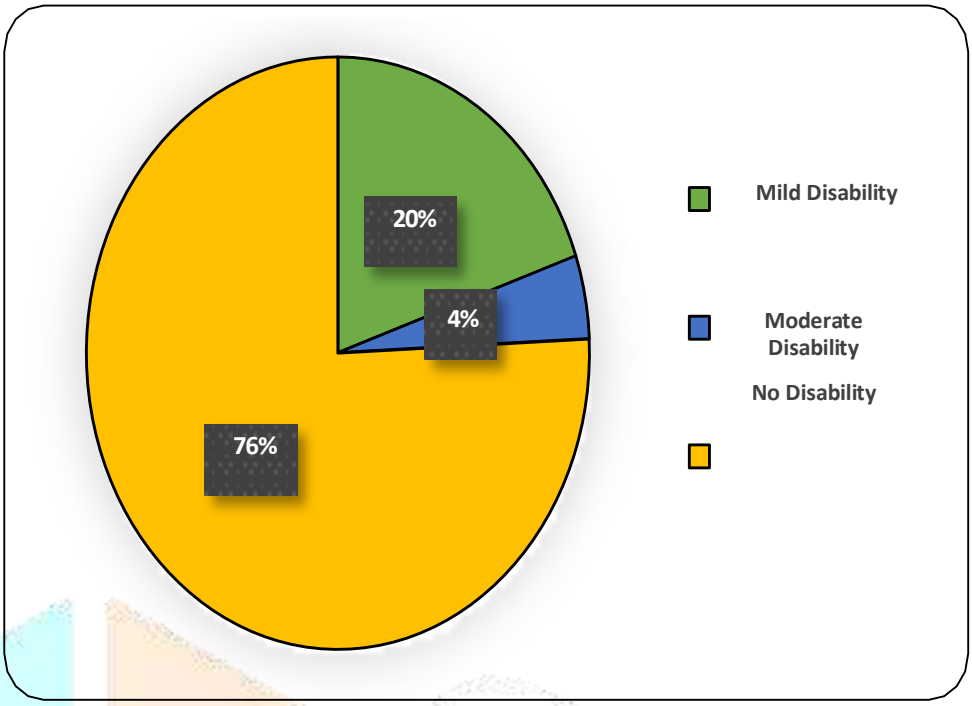


TABLE 4: PREVALENCE OF DASH

DASH Interpretation	Counts	% of Total
Mild Disability	26	19.70%
Moderate Disability	6	4.50%
No Disability	100	75.80%

Inference: Table 4 showed the results of the Disabilities of the Arm, Shoulder, and Hand (DASH) assessment for the study participants. The total sample size for this assessment is 132 (26 + 6 + 100). The majority of the participants, 100 individuals, or 75.80% of the sample, were classified as having No Disability according to the DASH score, indicating good upper extremity function. A minority of the sample reported some level of disability, with 26 participants (19.70%) classified with Mild Disability and 6 participants (4.50%) classified with Moderate Disability. This high proportion of participants with no DASH-related disability is a significant characteristic of the sample, suggesting that upper extremity function is largely unimpaired.

GRAPH 4: PREVALENCE OF DASH



DISCUSSION

The current cross-sectional study successfully achieved its objective of quantifying the prevalence and identifying the most common musculoskeletal disorder (MSD) in a cohort of young medical students with substantial self-reported smartphone use. The principal finding demonstrates an extremely high prevalence of neck disability (90.2%) among the participants, classifying it as the most pervasive MSD. This finding is particularly salient when contrasted with the significantly lower prevalence of upper-limb disability (24.2%) This pattern underscores a critical, specific health challenge within this academic demographic, which is characterized by a high mean pain intensity of neck disability (5.28/10) and significant daily smartphone usage (6hour/day).

Frequent neck flexion position, which alters the cervical spine's normal curve and increases stress on it, may be linked to neck impairment in smartphone users. This can cause irritation and spasm in the surrounding skeletal structures and ligaments. Overuse of cellphones can result in habitual, repeated, and constant head and neck movements toward the screen all day long. The substantial correlation between NDI and DASH scores in this study may be explained by the high risk of persistent neck pain associated with such motions.[3]

The head bends forward toward the smartphone screen when using it, causing bad posture that might result in chronic neck pain.[1] The physical demands of using a smartphone include repetitive thumb typing motions, elbow flexion, wrist and finger flexion, shoulder flexion and abduction, and neck flexion.[1] Recurrent neck flexion position and excessive use of the shoulder and hand musculature may be the cause of neck, shoulder, elbow, and hand disabilities in mobile phone users. In keeping with the findings of this study, extended smartphone use may result in upper back pain, neck and shoulder pain, musculoskeletal pain in the upper limb, neck and hand pain, and musculoskeletal pain in the neck, shoulder, and hand.[1]Long-term shearing of the vertebrae from forward head posture eventually irritates the soft tissues, ligaments, and small facet joints in the neck.[3] This inflammation may cause a number of disorders, such as: Trigger points in the muscles, which are sore spots that hurt to touch, as well as restricted range of motion, Neck pain that travels to the shoulder blades and upper back, issues with disc degeneration that could result in cervical herniated discs, cervical OA, or cervical degenerative disc disease, among other conditions.[3] Before the problem worsens, a few easy lifestyle adjustments can significantly assist reduce the text neck's muscular pain and stiffness.[3]

The 90.2% prevalence of neck disability (all classified as mild) is remarkably high compared to previously published literature on MSDs in university and medical students. While neck pain is consistently reported as a highly prevalent issue in this population, with studies reporting prevalence rates ranging from 31.7% to over 70% [2], our figure significantly exceeds the upper limit of this range. This exceptional prevalence, measured by the Neck Disability Index (NDI), suggests that not only is neck pain common, but it is also frequently associated with functional limitation in daily activities, even if those limitations are currently categorized as 'mild'

Furthermore, the average reported pain intensity of 5.28/10 on a numerical rating scale indicates a moderate and clinically significant level of pain. This level of discomfort, when coupled with the high rate of NDI-defined disability, confirms that the musculoskeletal issues are not merely transient discomforts but are interfering with the students daily lives and potentially their academic performance and quality of life. The finding of predominantly mild disability (NDI) alongside moderate pain intensity suggests that participants are experiencing notable pain, but the functional limitations are not yet in the severe or disabling ranges. This phase of 'mild disability' represents a crucial window for intervention to prevent progression to more debilitating states.AlAbdulwahab, Kachanathu, and AlMotairi (2017) [25] similarly utilized the Smartphone Addiction Scale and Neck Disability Index and concluded that addiction to smartphone use is directly associated with neck problems and disability among young adults, reinforcing the argument that persistent forward head posture significantly increases biomechanical stress on the cervical spine, leading to the high rates of mild neck disability observed in the present

CONCLUSION

This study reveals a high prevalence (90.2%) of mild neck disability among medical students, associated with moderate pain (5.28/10). The findings highlight the need for immediate institutional action to address neck issues as a public health concern and potential occupational hazard. Mandatory primary prevention programs focusing on cervical spine ergonomics, postural correction, and targeted exercises are recommended. Routine screening and behavioral counselling for smartphone overuse are also necessary to prevent progression to more debilitating conditions.

SUMMARY

A study investigated the prevalence of musculoskeletal disorders (MSDs) among medical students due to smartphone use. The study involved 132 students aged 18-25 from Motiwala College of Physiotherapy. Results showed 90.2% of participants had mild neck disability, while 75.8% had no upper limb disability. Female students were more affected. The study suggests prolonged smartphone use leads to musculoskeletal problems, particularly neck pain, due to forward head posture and biomechanical strain. Early intervention is recommended to prevent progression to more severe conditions. The study highlights the need for awareness and preventive strategies to combat MSDs in smartphone users. Smartphone addiction is a significant concern.

LIMITATIONS AND RECOMMENDATIONS

While providing clear evidence regarding the prevalence of MSDs, the cross-sectional design of this study inherently limits the ability to establish a direct causal relationship between smartphone use and neck disability. Although the temporal association is highly suggestive, future longitudinal studies are required to track participants over time and definitively prove that the intensity of smartphone use precedes the development and worsening of NDI scores. A second limitation is the heavily skewed gender distribution, which restricts the generalizability of the absolute prevalence rate to a gender-balanced population. Future research should aim for a more balanced sample or utilize statistical weighting to better account for gender differences.

The high prevalence of neck disability warrants immediate attention from health science administrators and curriculum developers.

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