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Association of Prolong Mobile Phone Use with Cervical Nerve Root Compression

Misbah Binte Ilyas[1], Hifza Arif[2], Javeria Jadoon[3]

[1,2,3] Helping Hand Institute of Rehabilitation Sciences Mansehra,
Email: [1]misbah.ilyas@hhirs.edu.pk, [2]khifi7882@gmail.com, [3]hod.slp@hhirs.edu.pk

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Abstract

Mobile phones have become a vital tool in modern life however excessive mobile phone use, averaging over 4 hours daily, is linked to various musculoskeletal disorders such as neck and shoulder pain. Prolonged poor posture and repetitive strain raise concerns about cervical nerve root compression. To determine the association between prolonged mobile phone use and cervical nerve root compression. A cross-sectional study was conducted among 375 adults (aged 18–30) in Mansehra and Abbottabad who used mobile phones for over 4 hours daily. Data were collected via questionnaire on demographics, mobile phone usage patterns, symptoms and activity related to neck and provocative test for cervical nerve root compression was done. Analysis was performed using SPSS with descriptive statistics, logistic regression, chi-squared tests, and correlation analysis. Most of the participants (65.3%) used phones 4–5 hours daily, mainly for calls (41.8%) and social media (36.0%). Over 41% reported pain or discomfort, particularly in the hands, arms, and neck. Common symptoms included tingling (43.5%). Out of the total participants, 31.5% showed a positive indication of nerve root compression, while the remaining 68.5% tested negative**.** Prolonged use of mobile phones has become increasingly common and is frequently linked to discomfort and symptoms indicative of cervical nerve involvement. These findings underscore the importance of ergonomic awareness, the incorporation of regular breaks, and the urgent need for further research into the potential health risks associated with extended mobile phone usage.

Keywords: Cervical Nerve Root Compression, Ergonomics, Mobile Phone Usage

Introduction

Smartphones have become essential tools in modern life, with over 6 billion users worldwide.(1, 2) While they offer undeniable convenience and connectivity, prolonged and excessive screen use has emerged as a significant public health concern.(3, 4) People who use smartphones usually lean their necks forward, hold their phones below eye level, and stare at the screen. Young people who use their phones while sitting, standing, or walking lean their heads forward by about 30 to 45 degrees from the vertical.(5-8) Extended screen time has been linked to a range of physical, mental and behavioral health issues, drawing increasing attention from researchers and healthcare professionals.(3, 4) One major physical health concern is the impact of long-term smartphone use on musculoskeletal health, particularly the neck and shoulders.(4) Sustained forward head posture, repetitive strain and poor ergonomics can lead to conditions such as cervical nerve root compression. This may result in pain, numbness, weakness in the arms and chronic discomfort, all of which can affect quality of life and daily functioning.(9) The most frequent adverse impact of extended, continuous usage of a mobile device or tablet is forward head position (FHP). This results in flexion and extension at the atlanto-occipital (C1 to C2) joints, flattening of the mid-cervical lordosis and the lower cervical spine (C4 to C7), which results in joint dysfunction, aberrant afferent signals influencing the

tonic neck reflex, and promotes the gradual adaption of forward head posture.(10) Long-term screen usage is very bad for health and wellbeing. Mobile phones are a necessity of the new millennium but overuse can be very harmful to one's health. Gazing onto devices from the moment one wakes until later at night is the habit practice which goes on to have serious effects on one's health and mind(11). Even though mobile phones have their benefits, people are now growingly concerned regarding the health risks that they may pose due to long time exposure. This effect is studied for scientific interest and public health reasons.(12) Beyond musculoskeletal issues, excessive mobile phone use has been associated with cognitive, emotional and social problems, including reduced attention span, increased stress and anxiety, social isolation, sleep disturbances and even addictive behaviors.(9) Understanding the specific relationship between smartphone use and cervical nerve root compression is especially important for developing effective prevention and intervention strategies.(13) The widespread use of mobile phones raises concerns about musculoskeletal health. Prolonged use may contribute to cervical nerve root compression due to biomechanical changes, repetitive stress and poor posture.(14) Although many studies have examined mobile phone usage and general health impacts, few have specifically addressed its association with cervical nerve root compression. This study seeks to determine the association between prolonged mobile phone use and cervical nerve root compression.

Methods

This observational cross-sectional study was conducted in the districts of Mansehra and Abbottabad over a period of four months, from July to October. A convenient sampling method was used to select participants who met the inclusion criteria. The target population was approximately 20,000 individuals across both districts, and the sample size was calculated as 375 using the Raosoft sample size calculator. Participants eligible for inclusion were males and females aged 18 to 30 years who reported using a mobile phone for more than four hours per day. Exclusion criteria included any history of genetic spinal deformity, injury to the neck or upper extremity, inflammatory joint disease, or prior surgical intervention at the neck or upper extremity. Informed consent was obtained from all participants, and the study received ethical approval from the Research and Ethical Committee of HHIRS. Participants were recruited sequentially as they met the inclusion criteria. Data collection was carried out using a self-administered questionnaire developed after an extensive review of the literature. This questionnaire collected demographic details such as name, gender, age, marital status, and occupation, along with information on prolonged mobile phone usage, duration, related activities, and any discomfort or pain experienced due to mobile phone use. The questionnaire was carefully developed through a structured process. Following the literature review, relevant data were organized into an initial draft of questions. This draft was then presented in a focused group discussion comprising experts from the rehabilitation department, including specialists in physiotherapy, psychology, prosthetics and orthotics, and speech and language pathology. Feedback and suggestions were incorporated, and the questionnaire was revised accordingly to ensure its relevance, clarity, and comprehensiveness for the study objectives. Data were analyzed using SPSS version 22.0. Descriptive statistics summarized demographic characteristics: means and standard deviations for continuous variables, and frequencies and percentages for categorical variables. Pearson correlation assessed associations between quantitative variables. Chi-square tests and cross-tabulations examined contributing factors.

Results

Data were collected from 375 participants**.** Among them, 242 participants (64.5%) were males, while 133 participants (35.5%) were females**.** The minimum age reported was 19 years, and the maximum age was 30 years**.** The mean age of the respondents was 23.92 years, with a standard deviation of 3.397, indicating a moderate spread of ages around the mean. The

majority of respondents were students (193 participants, 51.5%)**,** followed by employees (168 participants, 44.8%)**.** A small portion of the participants identified as unemployed (8 participants, 2.1%) and housewives (6 participants, 1.6%). The cumulative percentages confirm that all occupation categories were fully represented. Among 375 participants**,** 128 participants (34.1%) reported using their mobile phones for more than 6 hours per day, while 247 participants (65.9%) reported using their mobile phones for less than 6 hours per day**.**

Table: 1 (Demographics of research participants)

Variables	**Results**
Gender Males Females	64.5 % 35.5%
Occupation of participants Students Employee Un-employee House- wives	 51.5% 44.8% 2.1% 1.6%
Age (Mean ± Standard deviation)	23.92 ± 3.397

Table: 2 (Daily usage of mobile phone)

How often do you use your mobile phone	**Percentage**
4-5 hours/day	30.70%
5-6 hours/day	31.50%
6-7 hours/day	21.60%
More than 8 hours	16.30%

Table: 3 (Association of prolong mobile phone use with cervical nerve root compression

	Variable	**Categories**	**Diagnosis**		**P-Value Chi-square**
			Positive	**Negative**	
1	How often do you use your mobile phone?	4-5 Hours /Day	41 35.7%	74 64.3%	0.622 (1.769)
		5-6 Hours /Day	41 34.7%	77 65.3%	
		6-7 hours /Day	27 33.3%	54 66.7%	
		More than 8 Hours /Day	16 26.2%	45 73.8%	
2	What activities do you primarily use your mobile phone for? Calls	Yes	33 41.8%	46 58.2%	0.081 (3.207)
		No	92 31.1%	204 68.9%	
3	What activities do you primarily use your mobile phone for? Social media	Yes	94 36.0%	167 64.0%	0.060 (2.799)
		No	31 27.2%	83 72.8%	
4	What activities do you primarily use your mobile phone for?	Yes	24 32.4%	50 67.6%	0.485 (0.034)

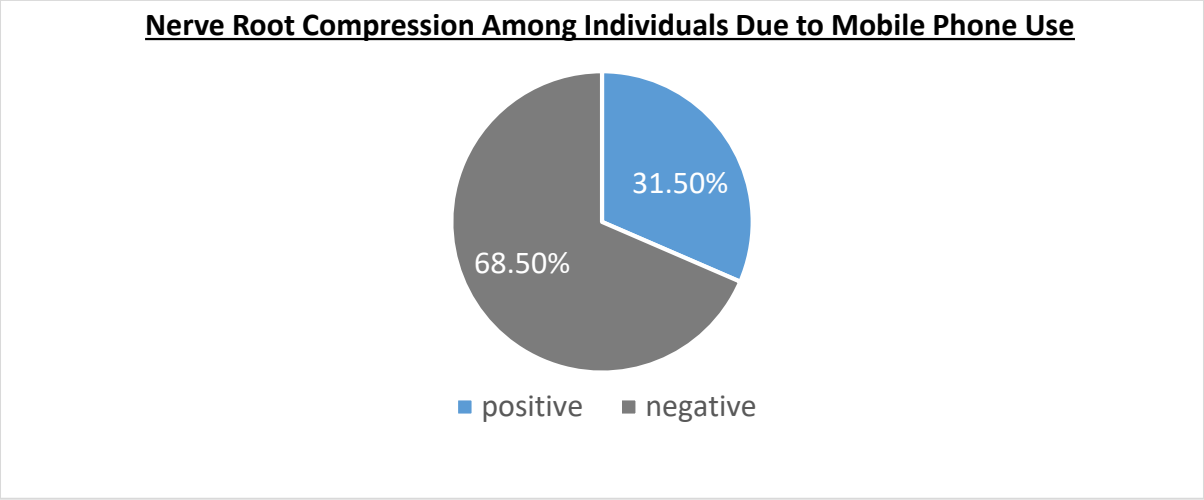
	Texting	No	101 33.6%	200 66.4%	
5	What activities Do you primarily use your mobile phone for? Browsing	Yes	18 41.9%	25 58.1%	0.357 (2.058)
		No	107 32.3%	224 67.7%	
6	What activities Do you primarily use your mobile phone for? Gaming	Yes	15 27.8%	39 72.2%	0.349 (0.876)
		No	110 34.3%	211 65.7%	
7	How many calls do you make with your mobile phone per day?	0-2	42 30.0%	98 70.0%	
		3-5	45 31.5%	98 68.5%	0.169 (3.554)
		More than 5	38 41.3%	54 58.7%	
8	How do you usually hold your mobile phone?	In one hand	85 34.8%	159 65.2%	
		In both hands	39 32.2%	80 67.8%	0.333 (2.200)
		On a table or surface	2 15.4%	11 84.6%	
9	In which position do you use your mobile phone mostly? Sitting	Yes	101 42.1%	139 57.9%	0.001 (2.969)
		No	24 17.8%	111 82.2%	
10	In which position do you use your mobile phone mostly? Standing	Yes	28 35.9%	50 64.1%	0.340 (0.291)
		No	97 32.7%	200 67.3%	
11	In which position do you use your mobile phone mostly? Lying	Yes	59 30.4%	135 69.6%	0.129 (1.543)
		No	66 36.5%	115 63.5%	

12	Do you spend more time using your mobile phone than intended?	Yes	88 34.4%	168 65.6%	0.530 (0.394)
		No	37 31.1%	82 68.9%	
13	Do you take regular breaks to stretch or move around while using your mobile phone?	Yes	85 30.8%	191 69.2%	0.054 (3.026)
		No	40 40.4%	59 59.6%	
14		Yes	110 41.7%	154 58.3%	0.000 (27.872)

	Do you experience any pain or discomfort while using your mobile phone?	No	15 13.5%	96 86.5%	
15	Do you experience any of the following symptoms during mobile phone use then select area? Neck pain	Yes	101 36.2%	178 63.8%	0.028 (4.032)
		No	24 25.0%	72 75.0%	
16	Arm pain	Yes	47 58.8%	33 41.3%	0.000 (29.563)
		No	78 26.4%	217 73.6%	
17	Shoulder pain	Yes	39 42.9%	52 57.1%	0.027 (4.904)
		No	86 30.3%	198 69.7%	
18	Elbow pain	Yes	42 42.4%	57 57.6%	0.067 (5.411)
		No	83 30.2%	192 69.8%	
19	Wrist pain	Yes	22 47.8%	24 52.2%	0.026 (4.956)
		No	103 31.3%	226 68.7%	
20	Have you experienced any of the following symptoms? Tingling or numbness in the hands or arms	Yes	54 43.5%	70 56.5%	0.002 (8.699)
		No	71 28.3%	180 71.7%	
21	Weakness in the arms or hands	Yes	53 41.7%	74 58.3%	0.014 (6.096)
		No	72 29.0%	176 71.0%	
22	Headache	Yes	83 39.9%	125 60.1%	0.009 (9.360)
		No	42 25.3%	124 74.7%	
23	How do you position your neck while using your mobile phone ?	0 degree	2 11.8%	15 88.2%	
		15 degree	7 20.0%	28 80.0%	
		30 degree	11 23.9%	35 76.1%	
		45 degree	75 38.3%	121 61.7%	
		60 degree	30 37.0%	51 63.0%	
24	Neck and arm pain select area?	P1 related to p2	51 46.4%	59 53.6%	0.002 (15.049)

		P1 not related to p2	69 30.0%	161 70.0%	
		None	5 15.6%	27 84.4%	
25	How often do you experience these symptoms?	Daily	56 38.6%	89 61.4%	0.000 (20.965)
		Weekly	53 40.8%	77 59.2%	
		Monthly	5 33.3%	10 66.7%	
		Rarely	11 12.9%	74 87.1%	

Figure 1 (Nerve root compression among individuals due to mobile phone use)



This figure illustrates the proportion of individuals experiencing nerve root compression associated with mobile phone use. Out of the total participants, 31.5% showed a positive indication of nerve root compression, while the remaining 68.5% tested negative.

Figure 2 (Association of cervical nerve root compression with activity of daily mobile phone use)

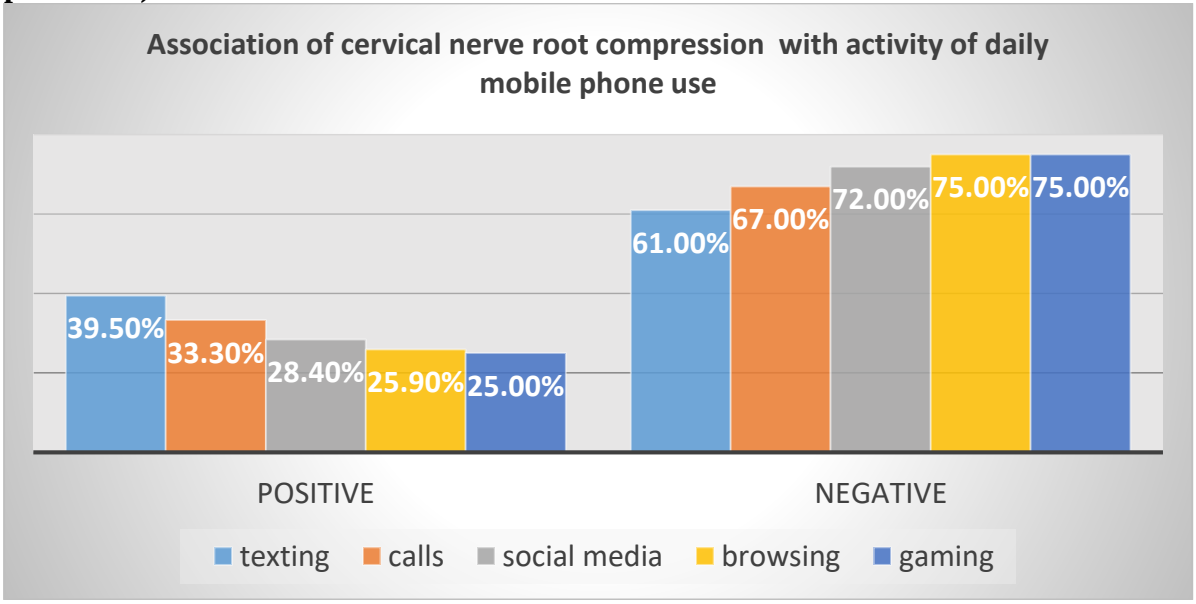
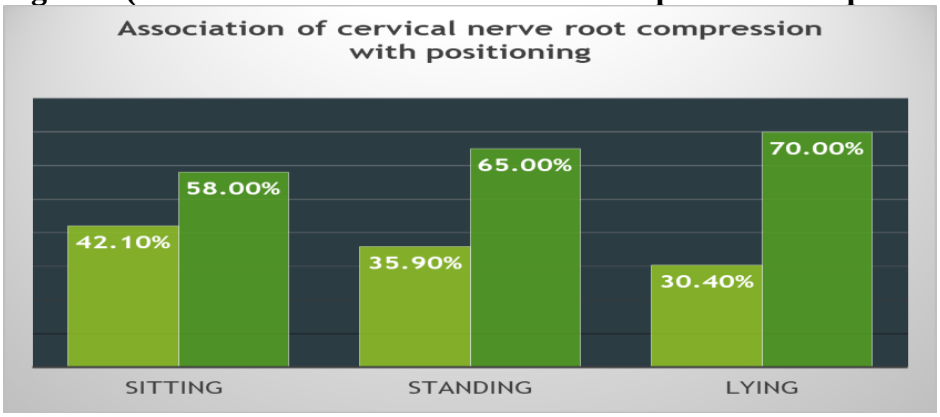


Figure 2 demonstrates the association between cervical nerve root compression and various daily mobile phone activities. Among participants who tested positive for nerve root compression, the most common activities were texting (39.5%), followed by calls (33.3%), social media use (28.4%), browsing (25.9%) and gaming (25.0%). In contrast, among those who tested negative, higher engagement was observed in browsing and gaming (both 75.0%), followed by social media use (72.0%), calls (67.0%), **and** texting (61.0%). This distribution showed that certain mobile phone activities, particularly texting and calling, may be more associated with positive cases of nerve root compression compared to others.

Figure 3 (Association of cervical nerve root compression with positioning)



This figure demonstrates the association between cervical nerve root compression and different body positions—sitting, standing, and lying. The data reveals a clear trend in how positioning influences the occurrence or severity of compression. In the sitting position, 42.1% of individuals experienced compression in one group, while this increased to 58.0% in the other group. When standing, the incidence dropped slightly to 35.9% in the first group but rose to 65.0% in the second group. Interestingly, the lying position demonstrated the most significant contrast, with only 30.4% affected in the first group compared to 70.0% in the second. These findings suggest that cervical nerve root compression is notably influenced by body posture, with the lying position associated with the highest prevalence in one group, indicating potential positional exacerbation in certain individuals.

Figure 4 (Association of cervical nerve root compression with neck angle)

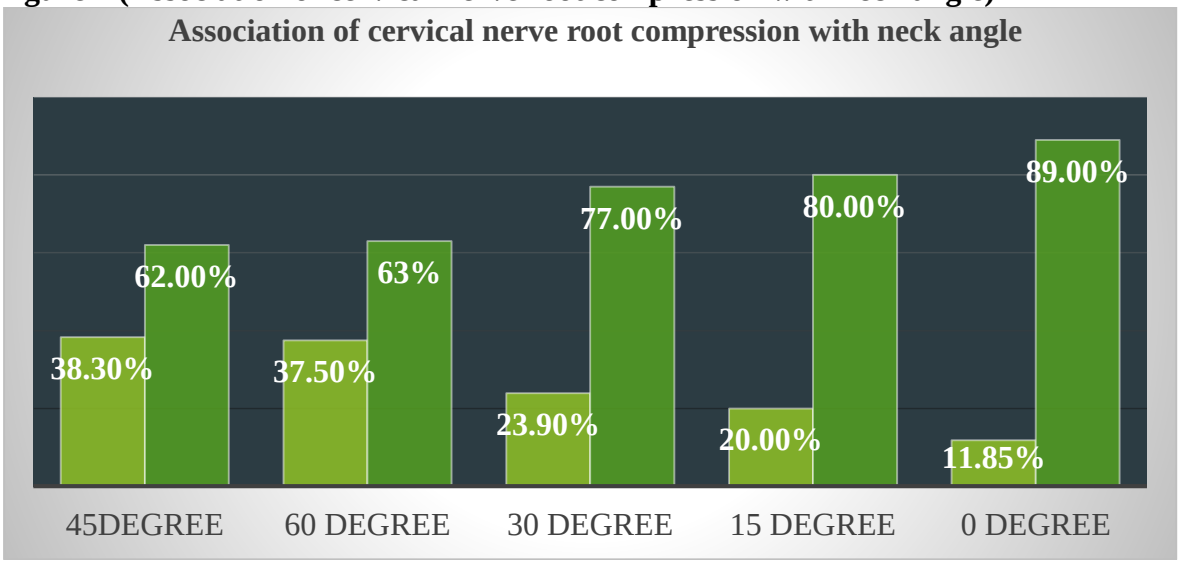


Figure 4 demonstrates a clear relationship between neck flexion angles and the prevalence of cervical nerve root compression. As the neck angle decreases from 45 degrees to 0 degrees the incidence of compression significantly increases. At 45 degrees, compression is observed in 38.3% of individuals, compared to 62% in the corresponding group. Similarly, at 60 degrees, 37.5% show compression versus 63% in the other group. The difference becomes more pronounced at 30 degrees, with only 23.9% experiencing compression in one group while 77% are affected in the other. At 15 degrees, the incidence rises to 80% in contrast to 20%, and at 0 degrees, the highest rate of 89% is observed, compared to only 11.8% in the opposite group. These findings suggest that a reduction in neck flexion angle (i.e., moving toward a more upright neck position) is associated with a greater risk of cervical nerve root compression, indicating the importance of posture in clinical evaluation and treatment planning.

Discussion

The present study, conducted among 375 adults aged 18–30 years, found that social media, messaging and calls were the main purposes of mobile phone use, reflecting typical usage patterns reported in other studies. Junghoefer et al. similarly identified social media as the most prevalent activity among younger users,(1) while Smith et al. noted a shift away from traditional calls and texts driven by mobile app convenience.(3) Most respondents reported using their phones while seated, aligning with findings by Jung et al. and Almeida et al, who highlighted sitting as the preferred posture for prolonged browsing and messaging. Most respondents reported using their phones while seated, aligning with findings by Jung et al. and Almeida et al., who highlighted sitting as the preferred posture for prolonged browsing and messaging. This preference for a seated position may be attributed to the increased comfort and stability it provides, allowing for extended use without physical strain. Furthermore, seated postures often enable better focus and interaction with the device, particularly when engaging in cognitively demanding tasks such as reading, typing, or watching videos. These results underscore the importance of ergonomic considerations in mobile phone usage patterns and support previous research suggesting that environmental and physical comfort significantly influence user behavior.(15) This study also demonstrated a significant association between prolonged mobile phone use and discomfort, including pain in the neck, shoulders, wrists, and hands. Over 41% of participants reported such discomfort, with symptoms like tingling and headaches being common. These results are consistent with previous research. Leung et al and Choi et al have linked poor neck posture and extended screen time to increased rates of tension-type headaches and eye strain, (11)while Kumar et al and Hirata et al similarly reported musculoskeletal pain associated with prolonged device use and poor ergonomic habits.(16) Furthermore, research on neck flexion angles during smartphone use supports these observations. Studies have shown that greater neck flexion (e.g., 45° or 60°) significantly increases muscular strain and discomfort, whereas maintaining a neutral neck posture minimizes risk (Ng et al.). These findings underscore the importance of ergonomic practices, such as maintaining a straight neck angle and taking regular breaks to reduce strain. Overall, the study reinforces the growing body of evidence that prolonged mobile phone use, especially with poor posture, is associated with musculoskeletal discomfort and symptoms suggestive of cervical nerve involvement. Public health efforts should emphasize ergonomic education and awareness to mitigate these risks. One significant limitation of this study was the restricted timeframe used to assess participants' mobile phone usage. This limited duration may not have accurately captured their typical usage patterns, potentially affecting the generalizability of the findings. Mobile phone behaviors and their physical effects tend to vary over time, and short-term evaluations might not have reflected the cumulative or long-term impact. Therefore, the results needed to be interpreted with caution. Future studies should have adopted a longitudinal design to gain a more comprehensive understanding of mobile phone usage patterns and their long-term consequences. Future research should have utilized longitudinal study designs to

monitor the long-term consequences of extended mobile phone use, particularly with regard to muscle strain, cervical nerve root compression, and other related conditions. It is recommended that follow-up workshops or online resources be organized to enable participants to continue learning about cervical health and to share their progress in implementing ergonomic practices. Additionally, there is a need to develop ergonomic guidelines for proper mobile phone handling and posture to minimize cervical strain. Incorporating exercises that strengthened the neck muscles should also advised to help prevent discomfort and reduce the risk of nerve-related complications. Lastly, future studies should encouraged to examine the dose-response relationship between the duration of mobile phone use and cervical nerve root compression in order to establish a threshold for safe usage.

Conclusion

This study highlights that using mobile phones for over an hour is associated with discomfort in the neck, hands and arms, as well as headaches, largely due to forward neck bending. These findings emphasize the need for better ergonomics, regular breaks and increased awareness to reduce discomfort and prevent long-term health issues.

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