Prevalence of Carpal Tunnel Syndrome Among School Teachers with Wrist Pain

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Abstract- Background: Carpal Tunnel Syndrome is a symptomatic compression neuropathy of the median nerve at the level of the wrist/hand characterized physiologically by evidence of increased pressure within the carpal tunnel and decreased function of the nerve at that level. It is characterized by numbness, tingling, hand & arm pain, loss of hand and pinch strength and muscle dysfunction. CTS is caused by physical occupational activities, such as repeated and forceful movements of the hand and wrist and also by doing work in awkward posture.

Objective: the objective of the study was to investigate prevalence of carpal tunnel syndrome in school teachers with wrist pain.

Methods: This observational study was conducted in various schools of Kolhapur city. Around 120 subjects were approached and 105 who met the inclusion and exclusion criteria were included in the study. Data was collected using Patient Rated wrist pain Questionnaire. Special test was performed on the subjects and then Boston carpel tunnel syndrome questionnaire (BCTQ) was used to check the severity of the carpal tunnel syndrome. Data was analyzed and prevalence was determined.

Results: 37.14% of population had wrist pain. 11% of population were tested positive for Phalen's test. Majority of the population showed mild severity which was assessed using Boston Carpal syndrome questionnaire.

Conclusion: This study concludes that there is 11% prevalence of carpal tunnel syndrome among school teachers of Kolhapur city.

Keywords: Carpal Tunnel Syndrome, symptomatic compression, median nerve, Phalen's test, Patient Rated wrist pain Questionnaire, Boston carpal tunnel syndrome questionnaire.

I. INTRODUCTION

A common condition called carpal tunnel syndrome (CTS) causes tingling, numbness and discomfort in the hand and arm. This is caused by pinching or compression of the median nerve while moving the wrist. Symptoms fall into three categories: mild, moderate and severe. With median nerve distribution affecting the thumb, index finger, middle finger, and radial aspect of the ring finger, CTS is characterized by hand discomfort, numbness, and tingling [1]. The median nerve is compressed or twisted at the level of the wrist in CTS, a common compression condition. It was originally described by Paget in 1913 and later described by Marie and Foix in 1913 and by Phalen in the 1950s, whose research led to CTS. Paget received the original description. [2] It has long been known that workers who primarily perform repetitive tasks or who adhere to temporary positions are at greater risk of work-related musculoskeletal disorders. These repetitive movements increase the pressure inside the carpal tunnel, which can reduce blood flow to the central nerve and cause a nerve block. CTS is a common serious disorder that affects peripheral nerves and causes numbness or weakness in the hand. 3.8% of people have itchy, painful and unresponsive hands. EMG tests and medical evaluations are usually used for diagnosis. For every 100,000 annual reports, there are 276 cases of CTS, with women accounting for 9.2% and men 6%, indicating a higher incidence in women than men [3]. CTS is the most common and well-known type of entrapment of the central nerve, accounting for 90% of all entrapment neuropathies. Increased pressure in inflexible anatomical structures results in a chronic focal compression neuropathy called entrapment neuropathy. The transverse carpal ligament and carpal bones define the carpal tunnel, which is the site of CTS neuropathy due to entrapment of the median nerve. According to physiological data, there is increased pressure in the carpal tunnel, which leads to a decrease in the function of the median nerve there. Pronator syndrome and anterior interosseous

nerve syndrome are two other types of neuropathies that involve median nerve entrapment. Compression of the median nerve of the forearm causing sensory changes in the distribution of the median nerve of the hand and the palmar skin distribution of the palmar eminence is known as pronator syndrome. The anterior interosseous nerve (AIN), the motor branch of the median nerve of the forearm, innervates muscles that have a complete or partial lack of motor function. This condition is known as anterior interosseous nerve syndrome. [4]

II. MATERIALS AND METHODS

Materials

Consent form, Patient Reported Wrist Pain Questionnaire, Boston Carpel Tunnel Syndrome Questionnaire, Data Collection Sheet.

Methodology: The above study is Observational Study, Ethical clearance was obtained from the institutional ethical committee of D. Y. Patil Education Society, Kolhapur. After the approval from the committee field work was started. Sample design: simple random sampling, Study Duration: Six months, Study Place: Kolhapur, Methods of data collection: convenient sampling method, Method of Data Analysis: Data analysis will be done with Unpaired T test

Inclusion criteria: Age group between 40 to 58 years, participants of both genders, School teachers in Kolhapur region, primary and Secondary school teaching staff, participants who have completed more than 5 years of job, willing to participate in study, Ability to give informed consent.

Exclusion criteria: Participants with any pathological diseases of upper limb, participants with any implants near wrist joint, open wound near wrist joint, participants with wrist instability, injuries to wrist in past 6 months, history of wrist surgeries in past 6 months.

Methodology

Prevalence of Carpal Tunnel Syndrome Among School Teachers with Wrist Pain in Kolhapur is a prevalent study which was performed on school teachers of various school in Kolhapur. Permission was obtained from various schools to conduct the research in their school premises. The subject was screened according to inclusion and exclusion criteria of the study. Written consent from the participant was priorly obtained from the participants. A brief Information regarding the study was given to the participants. Firstly, Patient reported wrist evaluation questionnaire was given to the participants. The questionnaire was explained simultaneously the participants were marking the questionnaire. Participants with positive wrist pain were filtered and were included in further study. Subjects with positive wrist pain were assessed by performing Phalen's test. The individuals whose Phalen's tests came positive were given the Boston carpal tunnel syndrome questionnaire for additional evaluation to determine the severity of carpal tunnel syndrome in school teachers. The statistical analysis was recorded, and the results were acquired.

Patient-Rated Wrist Evaluation

For the purpose to evaluate wrist pain and impairment in patients with a variety of wrist diseases, the Patient-Rated Wrist Evaluation (PRWE) questionnaire is frequently utilized. It is made up of targeted questions intended to assess the patient's level of discomfort and functional limitations. The PRWE questionnaire is intended to assess wrist discomfort and impairment in day-to-day activities. Patients can score their wrist pain and impairment on the PRWE, which has two subscales, from 0 to 10. PAIN subscale (0 being no pain and 10 being the greatest pain ever) ·Pain - 5 items SPECIFIC ACTIVITIES subscale (0 = no problem, 10 = unable to accomplish) - 6 items ·Regular activities: four things A total score can be calculated on a scale of 100 (0 = no disability), where pain and function difficulties are equally weighted, in addition to the values from each individual subscale.

Phalen's test

The Phalen's test is a provocative test used in the diagnosis of CTS. The test is performed by having the Participants fully flex their wrists by placing dorsal surfaces of both hands for one minute. Patient is asked to flexed his elbow and wrist in full flexion. The patient is instructed to press her hands' dorsal surfaces together and maintain this position for 30 to 60 seconds. By compressing the median nerve between the transverse carpal ligament and the anterior edge of the distal end of the radius, this position will raise the

pressure inside the carpal tunnel. An alternative method to explain the typical Phalen's test is that the patient bends their elbows between 0 and 30 degrees. Subsequently, the therapist requests that the patient elevate their forearm. Following that, the therapist holds the wrist at its greatest palmar flexion for 60 seconds. During the test the patient will be asked to explain each 15 seconds what she feels. Positive test: When the patient's symptoms reproduced and the test results show paraesthesia (burning, tingling, numbness) along the median nerve's distribution, it is considered positive. Negative test: Even after sustaining the motion for three minutes or more, the patient experiences no pain or other symptoms.

Boston carpal tunnel syndrome questionnaire

The Boston questionnaire assesses the intensity of symptoms and functional status in carpal tunnel syndrome patients. The symptoms severity scale (SSS) assesses Scale (FSS) assesses how the condition impacts daily life. The symptom severity scale consists of 11 questions including pain intensity, time of pain and suffering, and dormancy. Symptoms include weakness, night tingling, frequency, and skill level. Carpal Tunnel Questionnaire has excellent test- re test reliability, with correlation coefficients ranging from 0.8 to 0.9 for both scales.

III. RESULTS

Participants from age group of 40 to 58 were included in this study whereas 13 participants were excluded from the study on the basis of age and years of experience.

From the collected data 67 (64%) of the 105 samples were female, and 38 (36%) were male. Form the obtained result on an average the age of participants is 44.88±5.93, with male participants having average age of 44.94±5.82 and females having average age of 44.85±5.95.

Our study included the participants from primary and secondary sections having work experience more than 5 years. In an average the working experience of the school teachers is 17±6.33 years with average daily hours of working of 7.23±25.37.

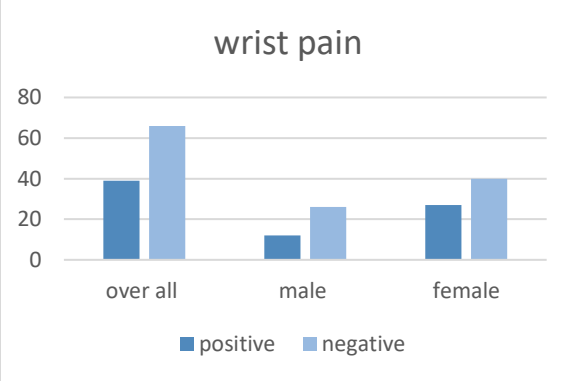
Parameters	Overall, N= 105	Males, N= 38	Females, N= 67
Age	44.88±5.93	44.94±5.82	44.85±5.95
Experience	17.00±6.33	18.68±5.76	17.26±6.41
Daily hours of working	7.23±25.37	7.05±0.68	7.31±0.89

Table1. Sociodemographic data and occupational characteristics

For assessing the wrist pain, Patient Rated Wrist Pain Questionnaire (PRWP) was used. On the basis of its scoring, those who scored above 24 points on PRWP were considered positive for the wrist pain.

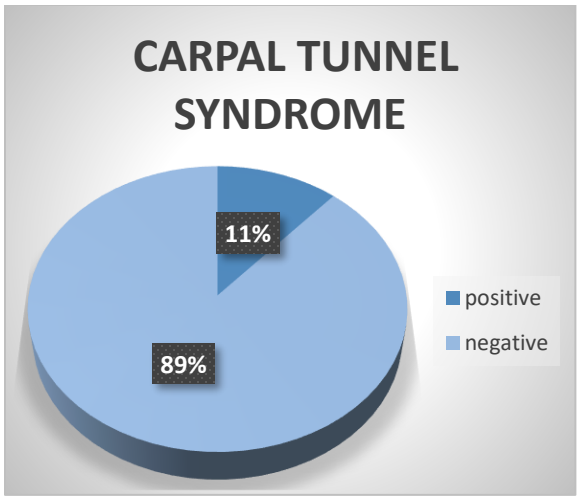
Wrist pain	Overall , n=105, mean(SD)	Male, n=38 , mean(SD)	Female, n=67, mean(SD)
Positive	39, 60.27±25.12	12, 41.16±10.19	27, 63±22.33
Negative	66, 9.41±7.47	26, 7.58±9.54	40, 8.83±7.47

Table.2 Subject scoring positive for wrist pain with mean and standard deviation



Graph1. Wrist pain in participants

39 participants out of 105 participants scored above 24 points on PRWP questionnaire amongst which 12 were male and 27 were female and were assessed further for carpal tunnel syndrome by performing Phalen's test. After the assessment total 12 participants were reported positive for carpal tunnel syndrome.



Graph2. Prevalence of carpal tunnel syndrome in school teachers with wrist pain

IV. DISCUSSION

The study investigates the prevalence of carpal tunnel syndrome (CTS) among school teachers in Kolhapur city, a region with a previously reported prevalence rate of 15.7%. Out of 105 respondents, 12 were found to be positive for CTS, indicating a significant burden of the condition. The study highlights the importance of addressing musculoskeletal health issues among the school teacher, especially given the demanding nature of their profession. The prevalence rate is higher than in other occupational groups, highlighting unique occupational hazards such as repetitive hand movements during writing, correcting notebooks and exam paper, using computers and doing other works. The relationship between wrist pain and CTS symptoms warrants attention from healthcare professionals and policymakers. One potential contributing factor to the elevated prevalence of CTS may be the lack of ergonomic awareness and inadequate workplace modifications. Demographic factors such as age, years of teaching experience, and daily work hours may also play a role in the prevalence of CTS among teachers. Future research should explore these associations to identify high-risk groups and develop effective preventive strategies tailored to the needs of educators in Kolhapur city.

Previous studies indicate a lower prevalence of CTS in teachers in Riyadh, at 9.1%, compared to the general population's 14.4% prevalence [5]. Younis et al.'s study revealed that 62% of symptomatic school teachers had clinically confirmed CTS, possibly due to the inclusion of only symptomatic teachers in their sample [6].

Wrist pain in school teachers

Out of 105 participants, 39 (37%) were found to be experiencing wrist pain. with 12 (31%) male participants and 27 (40%) female participants experiencing wrist pain. This highlights the significant burden of musculoskeletal disorders in the teaching profession, particularly concerning the wrist and hand regions. Factors such as repetitive tasks, prolonged periods of writing and grading papers, and the use of computers may contribute to the development of wrist pain among teachers.

39 out of 105 participants scored more than 24 on the PRWPQ, indicating a higher likelihood of experiencing wrist pain. This shows that there is sufficient burden of wrist pain in school teachers after per forming the daily dutiesor execrating them self. The gender disparity in wrist pain raises important considerations. It is essential to explore the underlying factors contributing to this difference and develop targeted interventions to address the specific needs of male and female teachers in managing and preventing wrist pain. Demographic factors such as age, years of teaching experience, and daily hours of work may also influence the prevalence of CTS among school teachers. Future studies should investigate these associations to identify high-risk groups and develop tailored interventions to reduce the incidence of CTS in the teaching profession.

Out of 105 participants, 44 scored less than 10, indicating a lower likelihood of experiencing significant wrist pain. However, 13 individuals scored 0 on the PRWPQ, suggesting the absence of any reported wrist pain symptoms. The distribution of scores on the PRWPQ highlights the variability in wrist pain severity among teachers, with some experiencing mild or intermittent symptoms, while others may be entirely asymptomatic. Understanding this spectrum of wrist pain severity is essential for developing targeted interventions and support strategies for educators in managing their musculoskeletal health.

Various studies were done to find out various musculoskeletal related pain in school teachers. by back pain was found to be most common in school teachers followed by shoulder pain. Wrist pain was also found to be common with prevalence rate of

15.75% to 16.2% [7][8] where as a study by Patience et.al in Botswana reported a 30.7% prevalence of wrist pain among teachers, which is significantly higher than other studies [9].

Future research should employ objective assessments and addressing ergonomic risk factors and promoting musculoskeletal health awareness, healthcare professionals and educational institutions can work together to support the well-being of school teachers and reduce the prevalence of wrist pain in the profession.

Wrist pain	Overall , n=105, mean(SD)	Male, n=38 , mean(SD)	Female, n=67, mean(SD)
Positive	39, 60.27±25.12	12, 41.16±10.19	27, 63±22.33
Negative	66, 9.41±7.47	26, 7.58±9.54	40, 8.83±7.47

Table3 subject scoring positive for wrist pain with mean and standard deviation

Phalen's test

The study analysed the prevalence of carpal tunnel syndrome (CTS) among school teachers in Kolhapur city, using the Phalen's test as a diagnostic tool. Out of 105 participants, 12 tested positive for CTS, indicating a significant burden of the condition. The severity of symptoms, ranging from moderate to severe provocation, suggests that a subset of teachers may be experiencing considerable discomfort and functional impairment. Symptoms like numbness, tingling, and pain in the median nerve distribution can impact daily tasks, leading to decreased productivity and quality of life with quality of teaching.

From previous studies it is found that Phalen test is a classic diagnostic tool for Carpal Tunnel Syndrome (CTS), with sensitivity ranging from 42 to 85% and specificity from 54 to 98%. This study evaluated the sensitivity and specificity of tests including the percussion (Hoffmann-Tinel) test as well. Results showed sensitivity and specificity of 85 and 89% for the Phalen test and 67 and68%for the percussion test. [10] The findings emphasize the importance of early detection and intervention in managing CTS among teachers. Prompt diagnosis and appropriate management strategies, such as ergonomic modifications, splinting, physical therapy, and in severe cases, surgical intervention, can be suggested and prevent long-term complications. Proactive measures to address occupational risk factors contributing to wrist pain and median nerve compression, such as ergonomic workstation adjustments, regular breaks, proper wrist posture and movement techniques training, and access to occupational health services, may help mitigate the prevalence and severity of CTS in the teaching profession. Raising awareness of musculoskeletal health issues among school teachers and healthcare professionals is also crucial for early recognition and management of CTS. In conclusion, the study highlights the significant prevalence of CTS among school teachers in Kolhapur city. By addressing occupational risk factors and implementing targeted interventions, healthcare professionals and educational institutions can work together to support the well-being of school teachers and alleviate the burden of CTS.

CARPAL TUNNEL SYNDROME	TOTAL	PERCENTAGE
POSITIVE	12	11%
NEGATIVE	93	89%

Table4 prevalence of carpal tunnel syndrome

CARPAL TUNNEL SYNDROME	MALES	PERCENTAGE
POSITVE	2	5%
NEGATIVE	36	95%

Table5 Prevalence of carpal tunnel syndrome in males

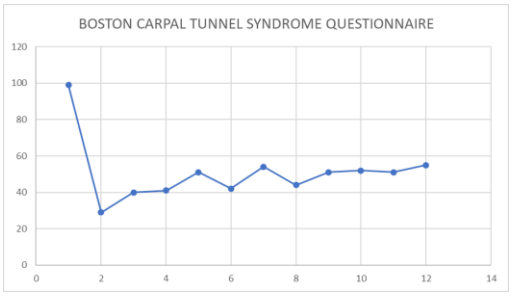
CARPAL TUNNEL SYNDROME	FEMALE	PERCENTAGE
POSITVE	10	15%
NEGATIVE	57	85%

Table6 Prevalence of carpal tunnel syndrome in females

BCTSQ

Further we checked for the severity of Carpal Tunnel Syndrome (CTS) among school teachers in Kolhapur city, using the Boston Carpal Tunnel Syndrome Questionnaire. The results show a moderate level of severity associated with CTS, with 10 participants scoring between 40 and 55 on the questionnaire. However, the study's limitations include a small sample size and potential self-reporting bias. Future research could benefit from larger sample sizes and

objective measures to further understand the prevalence and risk factors associated with CTS in specific occupational groups [16][27].



Graph3. Scoring of carpal tunnel syndrome

Ahmed H. AlHussain et.al studied the CTS in 409 samples from various schools in Riyadh amongst which 40% reported moderate to mild symptoms. 163 samples experiences CTS while our study showed 11 % tested positive for CTS syndrome amongst school teachers in school city.

V. CONCLUSION

The goal of our study was to investigate the prevalence rate of carpal tunnel syndrome among school teachers in Kolhapur city. According to our research, 37% of school teachers were having wrist pain. Further 11% of school teacher irrespective to the subject reported positive for carpal tunnel syndrome. wrist pain and carpal tunnel syndrome was much more common in female school teachers than in male school teachers.

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