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RESEARCH ARTICLE
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PREVALENCE OF CARPAL TUNNEL SYNDROME IN MULTIGRAVIDA PREGNANT WOMEN: A CROSS-SECTIONAL STUDY

Dr. Tayyaba Siddique[1], Dr. Aimen Kaleem[2], Dr. Nadia Jabeen[3], Dr. Tahreem Sehar[4], Dr. Tahreem Rasheed[5], Dr. Muhammad Asim Iqbal Qureshi[6]

[1]MBBS, FSPS Gynecology and Obstetrics consultant at THQ hospital Wazirabad Gujranwala dr.taysid@gmail.com
[2]MBBS, FSPS Gynecology and Obstetrics Consultant at Brig. Shafiq Memorial Trust Hospital kaleemaimen@yahoo.com
[3]MBBS, FSPS Gynecology and Obstetrics Rawal institute of health sciences, affiliated with Rawal Medical and dental college Islamabad njj69@hotmail.com
[4]MBBS, FSPS Gynecology and Obstetrics PIMS, Islamabad *lilyflora260@yahoo.com*
[5]MBBS, FSPS Gynecology and Obstetrics Assistant Professor, Gynecology and Obstetrics Department Bakhtawar Ameen Teaching Hospital, Multan tehreemrasheed01@gmail.com
[6]MBBS, FSPS Gynecology and Obstetrics Associate Professor, Obstetrics and Gynecology Bakhtawar Amin Medical College and Teaching Hospital, Multan asim@faculty.bamdc.edu.pk

***Corresponding Author:** Dr. Tahreem Sehar
*MBBS, FSPS Gynecology and Obstetrics PIMS, Islamabad *lilyflora260@yahoo.com*

Abstract

Background: Carpal tunnel syndrome (CTS) occurs when the median nerve is compressed as it passes through the carpal tunnel, causing tingling, numbness, and pain in the hands and fingers. To diagnose CTS in pregnant women, the Boston Questionnaire was used alongside physical tests such as the Phalen test, carpal compression test, and Tinel's sign test.

Objective: To determine the prevalence of carpal tunnel syndrome among multigravida pregnant women.

Methodology: A cross-sectional study was conducted at Lady Reading Hospital, Peshawar, Khyber Pakhtunkhwa, over six months. Convenience sampling was employed to recruit 218 multigravida pregnant women of various age groups. Data were collected using a consent form and a questionnaire on carpal tunnel syndrome.

Results: Out of 218 participants, 90 (41.3%) were diagnosed with CTS, while 128 (58.7%) did not have CTS. Among the 218 women, 86 (39.4%) reported an impact on their activities of daily living (ADL), while 132 (60.6%) reported no difficulties in ADL. The association between age and the prevalence of Carpal Tunnel Syndrome (CTS) among the participants illustrated the highest prevalence of CTS among the 32–35 age group.

Conclusion: According to the study the overall finding was that the severity of symptoms of the CTS were not often seen in multigravida pregnant women. The general effect of the condition was mild and did not affect daily activities and participation to any significant extent. Furthermore, it was also observed that the prevalence of CTS among multigravida women was comparatively lower than that recorded for primigravida women.

Keywords: Prevalence, pregnancy, carpal tunnel syndrome, multigravida

Introduction

Carpal Tunnel Syndrome (CTS) is characterized by the entrapment of the median nerve within the carpal tunnel, formed by the transverse carpal ligament, longitudinal carpal ligament, and surrounding hand muscles.(1) This compression often arises from conditions like tendinitis, synovial thickening of ligaments and tendon sheaths, or other causes, and is recognized as the most common type of mononeuropathy.(2) Pregnancy can exacerbate or even trigger CTS due to physiological changes such as fluid retention, hormonal fluctuations, and weight gain.(3)

During pregnancy, the hormone relaxin is hypothesized to contribute to ligamentous laxity, potentially affecting the carpal tunnel's structure.(4) Research has shown that relaxin receptors in the anterior oblique ligament may induce joint laxity and predispose women to conditions like carpometacarpal arthritis.(5) Furthermore, fluid retention in late pregnancy can lead to significant edema, compressing the median nerve and causing symptoms of CTS.(6) Imaging studies, including radiography and ultrasonography, have revealed median nerve impingement and anatomical anomalies like hamate bone hypoplasia in CTS patients.(7) Early diagnosis is critical to enable effective and less invasive treatment options.(8, 9)

Studies indicate that CTS affects up to 62.0% of pregnant women, making it one of the most frequent pregnancy-related conditions.(10) The third trimester is particularly associated with a higher prevalence due to peak fluid retention and weight gain.(10, 11) Symptoms of CTS, including pain, numbness, and paraesthesia, often resolve postpartum, though some women may continue to experience discomfort requiring intervention.(12) Notably, CTS is more common in primigravida women compared to multigravida women, with severe cases often reported on pain scales.(13)

Several studies have explored the prevalence and associated factors of Carpal Tunnel Syndrome (CTS) in pregnant women, highlighting its impact during different stages of pregnancy. A study by Kisli. 2020 from Turkey investigated the relationship between recurrent pregnancies and CTS and revealed no significant association between the number of pregnancies and the development of CTS ($p > 0.05$). (14) Another study by Ajroud et al., 2020 from Libya conducted at Al-Wahda Hospital, Derna, examined the prevalence and characteristics of CTS among antenatal patients. Among 74 pregnant women diagnosed with CTS, the majority experienced symptoms during the third trimester, with homemakers being the most affected group. (15) A study conducted by Smitha et al., 2020 from India involved 371 pregnant women at Yenepoya Medical College Hospital, Mangalore. In their study, CTS was identified in 9% of the participants, with prevalence rates increasing from 3.6% in the seventh month to 11.3% in the ninth month. Tinel's sign was notably more common in the last trimester, emphasizing the heightened risk of CTS in late pregnancy. (16)

A study conducted in Pakistan by Rehman et al., 2023 included 482 pregnant women, identifying CTS symptoms in 111 participants, with a prevalence of 23.03%. Ultrasonography was not effective in distinguishing between symptomatic and asymptomatic individuals. The symptoms were generally mild, affecting manual functionality. The study highlighted risk factors including left-handedness, gestational diabetes mellitus, and advanced maternal age as significant contributors to CTS in pregnant women.(13) Another study conducted in Pakistan by Bukhari et al., 2020 explored the Prevalence of Compression Neuropathies during Pregnancy in a three-month cross-sectional study involving 218 pregnant women at private hospitals in Lahore. Their research focused on the prevalence and causes of neuropathies, particularly during the third trimester. (17)

CTS is one of the most prevalent neuropathies in pregnancy, significantly impacting the quality of life of affected women. Multigravida pregnant women are particularly vulnerable due to the cumulative physiological changes associated with successive pregnancies, such as increased fluid retention, weight gain, and hormonal fluctuations, which exacerbate the compression of the median nerve within the carpal tunnel. Despite the frequency of this condition, limited local data is quantifying its prevalence and exploring its specific impact on multigravida women in healthcare settings.

Understanding the burden of CTS in this population is crucial for early identification and management, as delayed intervention can result in prolonged symptoms, affecting daily functionality and postpartum recovery. Moreover, local studies can provide insights into the unique socioeconomic and cultural factors that may influence the presentation and management of CTS in this region. By identifying the prevalence, this study aimed to investigate the prevalence of CTS among multigravida pregnant women.

Methodology

The study design was a cross-sectional study conducted at Lady Reading Hospital (LRH), Peshawar, Khyber Pakhtunkhwa, over six months. The sample size was calculated using OpenEpi software, at a confidence level of 95%, bound on error of 5%, and an anticipated frequency of 17% (21), the sample size is calculated as 218.

Inclusion criteria for the study were females aged between 20 to 35 years, who were pregnant with their second or subsequent pregnancies. Exclusion criteria included women with wrist fractures, hyperthyroidism, non-pregnant women, primigravida women, women who had previously undergone wrist surgery, and those with type 1 diabetes, gestational diabetes, or neuropathies like trauma and rheumatoid arthritis.

After obtaining approval for the research proposal, the data were collected from the selected population under the supervision of one physiotherapist at Lady Reading Hospital (LRH). Before data collection, permission was taken from the respected authorities, and an information sheet was provided to the participants. Approval was obtained from the Head of the Physical Therapy Department. Patients were informed visually about the aims and objectives of our study. Consent forms were given to the participants and explained to them. It was made clear to the participants that their names or addresses would be kept confidential. The participants were also informed that the research study results would not harm them. The Phalen test was performed by asking participants to hold their wrists in complete flexion for 60 seconds. A positive test was indicated by paresthesia in the median nerve distribution within 60 seconds.

The data was generated based on mean distribution. There was no association of variables in our study. The age was described using a frequency distribution. Data for CTS and FS were generated using the mean, with less than the mean indicating no CTS and greater than the mean indicating a CTS and severe ADL. The BQCTS questionnaire was used for data collection and was validated in Urdu language. A pilot study was conducted with 30 participants over two weeks to test the feasibility of procedures and clarity of questionnaires. Scores vary from 18 to 44, with "18" indicating normal at all and "44" indicating the most severe CTS. FS results were analyzed by using the scores 13 to 39 with “13” normal functional while “39” indicating severe patient.

Data were coded and entered into a Microsoft Excel sheet and analyzed using SPSS version 27. Continuous variables were summarized as means, standard deviations, and ranges, while categorical data were presented as frequencies and percentages. The results were presented through tables and graphs.

Results

Demographic Data

The age distribution of the 218 participants in the study shows that the majority of the participants (29.8%) were in the 32-35 age group. The second largest group was the 23-25 age range, accounting for 21.6% of the participants. The 26-28 age group represented 19.7%, followed by the 29-31 age group with 18.3%.The smallest group was the 20-22 age range, comprising 10.6% of the total participants. These results highlight a concentration of participants in the older age categories, particularly in the 32-35 range. (Table 1) (Figure 2)

Table 1: Age Distribution of Participants		
Age Range	**Frequency**	**Percent**
20-22	23	10.60%
23-25	47	21.60%
26-28	43	19.70%
29-31	40	18.30%
32-35	65	29.80%
Total	218	100.00%

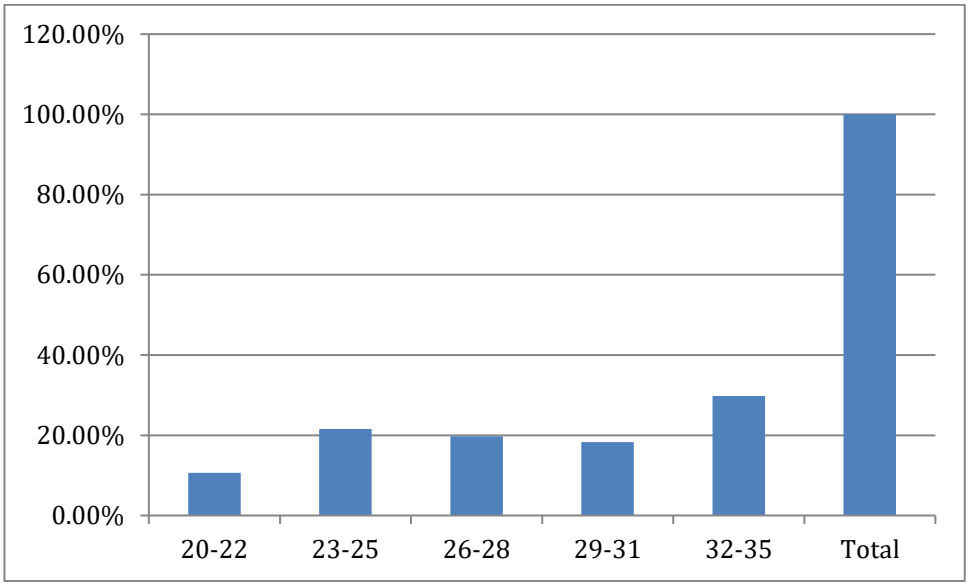

Figure 2: A Bar Graph Illustrating the Age Distribution of Participants

Frequency of Carpal Tunnel Syndrome:
A total of 128 (58.7%) participants were normal while 90 (41.3%) exhibited symptoms of CTS. (Figure 3) The severity distribution of Carpal Tunnel Syndrome (CTS) among the participants was analyzed based on a mean score of 18.1± 9.71, where scores below the mean were considered as indicating no CTS, and scores above 18.185 were categorized as having CTS. (Table 2) A majority of the participants, 58.7%, were classified as having normal severity. Mild severity was observed in 22% of the cases, while 17.4% experienced moderate severity. Only 1.8% of the participants were classified with severe CTS. (Table 3) (Figure 4)

Table 2: The Mean Value of Carpal Tunnel Syndrome	
Statistic	**Value**
CTS (Mean ± SD)	18.1± 9.7
CTS: Carpal Tunnel Syndrome	

Table 3: Frequency of Carpal Tunnel Syndrome based on Severity		
Severity	**Frequency**	**Percent**
Normal	128	58.70%
Mild	48	22.00%
Moderate	38	17.40%
Severe	4	1.80%
Total	218	100.00%

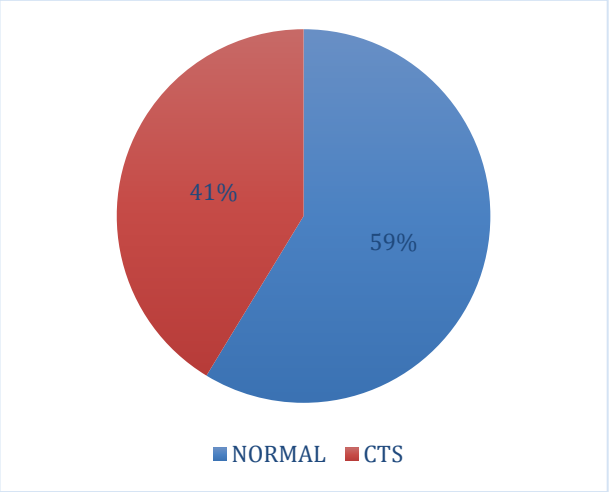

Figure 3: A pie chart illustrating the distribution of participants based on the presence or absence of Carpal Tunnel Syndrome (CTS).

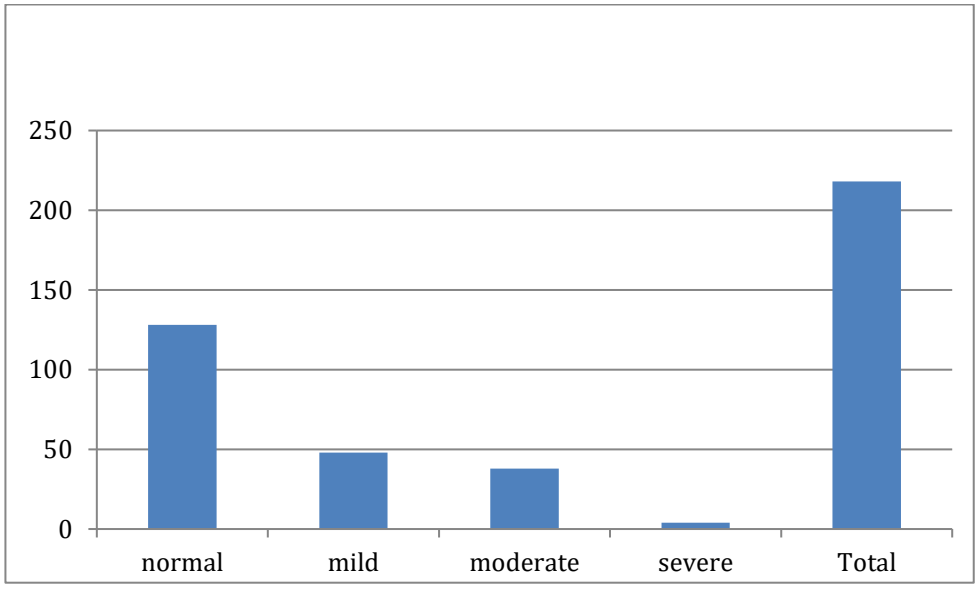

Figure 4: A Bar Graph Illustrating the Frequency of Carpal Tunnel Syndrome based on Severity

Frequency Of Functional Status of ADL:

A total of 132 (61%) females had no difficulty performing normal activities of daily living (ADL), while 86 (39%) experienced difficulties in performing ADL. (Figure 5) The severity distribution of functional status among the participants was analyzed based on a mean score of 13.9 ± 8.0, where values less than the mean were considered as not affecting daily living activities, while values greater than the mean were considered as affecting daily living activities. (Table 4) The majority (60.6%) of patients were classified as normal indicating that they had no significant difficulty performing daily activities. A smaller percentage of participants experienced mild (16.1%) or moderate (19.7%) difficulty with ADLs, while only 3.7% reported severe impairment in their daily functioning. (Table 5) (Figure 6)

Table 4: The Mean Value of Functional Status of Activity of Daily Living (ADL)	
Statistic	**Value**
FS (Mean ± SD)	13.9 ± 8.0
FS: Functional Status	

Table 5: Frequency Of Functional Status of ADL based on Severity		
Severity	**Frequency**	**Percent**
Normal	132	60.60%
Mild	35	16.10%
Moderate	43	19.70%
Severe	8	3.70%
Total	218	100.00%

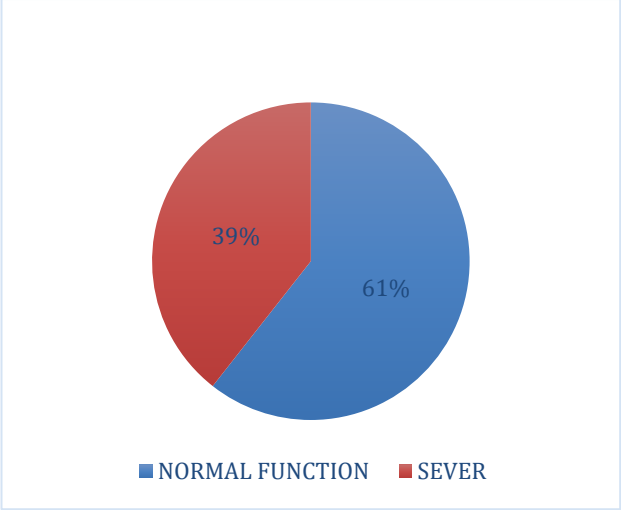

Figure 5: A Pie Chart Illustrating the Distribution of Participants Based on the Normal or Severe Functional Status (FS).

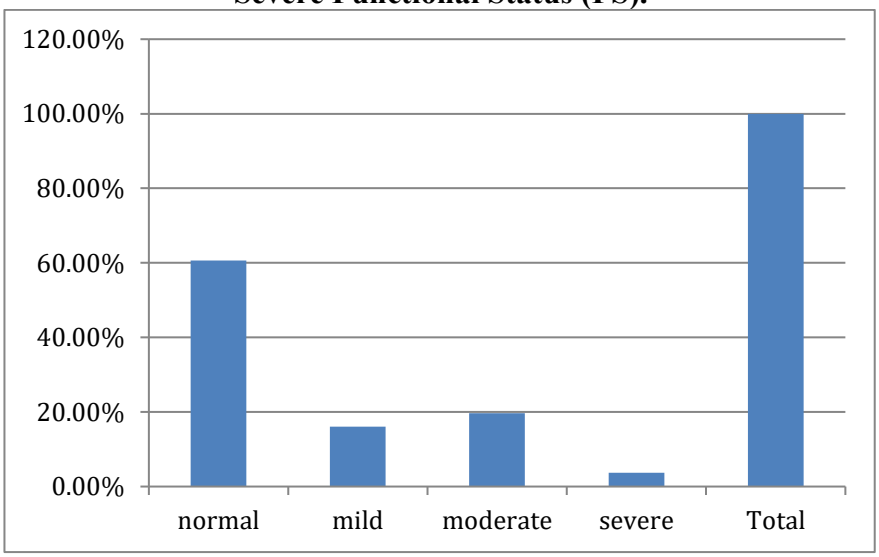

Figure 6: A Bar Graph Illustrating the Frequency of Functional Status of ADL based on Severity

Association of Age with Carpal Tunnel Syndrome:

The association between age and the prevalence of Carpal Tunnel Syndrome (CTS) among the participants illustrated the highest prevalence of CTS among the 32–35 age group, where 47.7% of participants had CTS, while 52.3% of participants did not. Similarly, in the 23–25 age group, 43.5% of participants had CTS, and 56.5% were unaffected. The age groups 26–28 and 29–31 showed similar trends, with CTS present in 41.9% and 33.3% of participants, respectively. In contrast, the 20–22 age group had the lowest prevalence of CTS, with only 31.8% of participants affected as compared to 68.2% who were unaffected. Overall, the data suggest a higher occurrence of CTS in older participants, particularly in the 32–35 age range. (Table 6) (Figure 7)

Table 6: Association of Age with Carpal Tunnel Syndrome

Age (In years)	Carpel Tunnel Syndrome		Total
	Absent	Present	
20-22	15 (68.2%)	7 (31.8%)	22 (10.0%)
23-25	26 (56.5%)	20 (43.5%)	46 (21.1%)
26-28	25 (58.1%)	18 (41.9%)	43 (19.7%)
29-31	28 (66.7%)	14(33.3%)	42 (19.2%)
32-35	34 (52.3%)	31 (47.4%)	65(29.8%)
Total	128 (58.7%)	90 (41.3%)	218(100%)

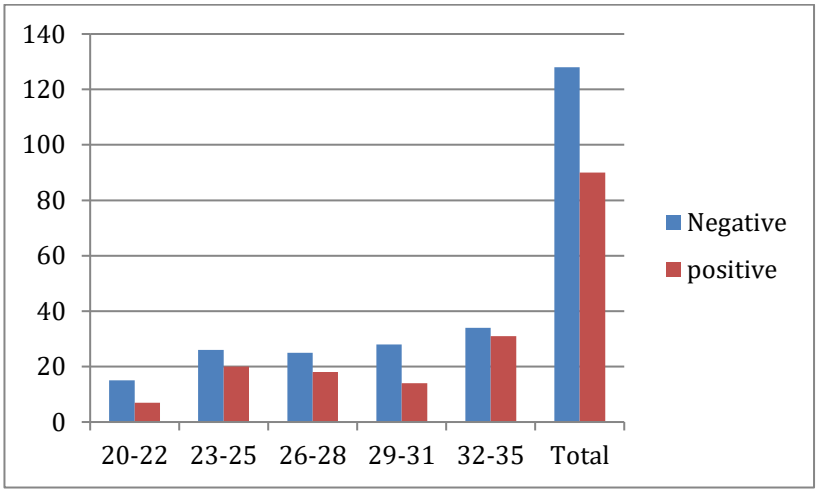

Figure 7: A Bar Graph Illustrating the Association of CTS with Age

Discussion

The purpose of this research was to identify the incidence of CTS in multiparous pregnant women in Peshawar. This topic was selected because there is a lack of literature on the incidence of CTS in this particular population, and potential contributors of CTS such as age, ethnicity, and geography are not well understood.

Alahgholi A. et al., 2022, from Iran, indicated that most pregnant women have CTS during their pregnancy, which can be considered a well-established pregnancy complication.(10) However, in contrast, our study targeting multiparous women noted that only 41% of them had CTS. This difference indicates that CTS prevalence could depend on pregnancy history. Another cross-sectional study conducted among pregnant women in Libya by Ajroud et al., 2020 also indicated a CTS prevalence of 24.3% and the age distribution of the participants was 28–32 years (33.8 %) and 33–37 (32.4 %). Most affected individuals were housewives (51.3%), with a lower prevalence among teachers (25.7%) and engineers or nurses (1.35% each).(15) In accordance, our study found a higher prevalence of CTS (41%) among 218 multiparous housewives. Of these, 29.8% were aged 32–35, 18.3% were 29–31, 19.7% were 26–28, 21.6% were 23–25, and 10.6% were 20–22 years. Both studies highlight a notable prevalence of CTS among pregnant and multiparous women, with housewives being significantly affected. However, age distribution differed slightly between the studies, with most participants in both falling in their late twenties to mid-thirties.

Pari S et al., 2021 found a CTS prevalence of 29.11% among 322 pregnant women in their third trimester, with 27.6% of those affected experiencing mild CTS, 12.1% moderate, 2.8% severe, and 2.8 % having very severe pain.(18) In comparison, our study of 218 multiparous women revealed a higher prevalence of 41%. Among these, 16.1% had mild CTS, 19.7% moderate, and 3.7% severe. This indicates a lower incidence of severe CTS in multiparous women compared to pregnant women in general.

A study conducted by Afshar A. et al., 2021 reported 383 pregnant women beyond 28 weeks of gestation and found that 67.4% experienced hand and wrist symptoms related to CTS, while 32.6%

were asymptomatic.(11) In our study of 218 multiparous women, 41% had CTS symptoms, while 59% were symptom-free. Only 3.7% of the women were classified as having severe CTS, further emphasizing a lower severity rate in multiparous women.

A study by Abd Elmoniem et al., 2018 from Egypt focused on the impact of educational interventions on CTS knowledge, symptom severity, and functional status among pregnant women. It reported that 70% of participants experienced moderate wrist and hand pain, 22% mild pain, and 8% severe pain.(19) In our study, where 90% of participants were uneducated and from rural areas, the severity of CTS was lower, with 3.7% having severe CTS, 19.7% moderate, and 16.1% mild. This highlights the potential impact of awareness and education on CTS severity.

Lastly, a cross-sectional study conducted by Mateen A et al., 2024 from Lahore, Pakistan on 256 pregnant women, found that 30.0% experienced daytime numbness and 46.0% had CTS.(20) In accordance, our study selected women diagnosed with CTS during physical tests and found a lower prevalence of daytime numbness (40.4%) and a higher overall prevalence of CTS (41.0%). These findings suggest potential similarities in symptom presentation and severity between general pregnant women and multiparous women.

The clinical implications of the present study for the management of carpal tunnel syndrome (CTS) among multigravida pregnant women is that health care givers can use diagnostic assessment tools like the Boston questionnaire and physical tests to estimate the symptoms and their severity with a view of initiating early strategies that check progression of the disease. Less significant effect on the activities of daily living pointed out in this study indicates that the role-playing CTS symptoms in antenatal care, complemented with physiotherapy and ergonomic instruction, is sufficient to manage the severity of the condition.

Conclusion

According to the study, the overall finding was that the severity of symptoms of the CTS was not often seen in multigravida pregnant women. The general effect of the condition was mild and did not affect daily activities and participation to any significant extent. Furthermore, it was also observed that the prevalence of CTS among multigravida women was comparatively lower than that recorded for primigravida women.

Future Recommendations

Future research with a larger population sample mandate is recommended to collect larger database information and develop more credible and genuine findings. The type of approach that is most highly recommended is the experimental because of the possibility it affords for a comparative study of all the treatment protocols rather than observational studies. The same applies to the development and application of progressive physiotherapy-based experimental interventional approaches that focus on slowing down or even reversing the manifestations of CTS.

More research should essentially begin estimating CTS prevalence among working multigravida women to evaluate occupational factors that may lead to the development of the disease. Furthermore, it may be crucial to identify which gestational period could have the worst symptom severity in patients with CTS to prevent or treat this specific population effectively.

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