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Original Research Article

Prevalence and Severity of Carpal Tunnel Syndrome in Pregnant Women Using Electrodiagnosis

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Abstract:

Background: Carpal tunnel syndrome (CTS) is a common entrapment neuropathy caused by median nerve compression, leading to sensory and motor hand symptoms. Pregnancy predisposes women to CTS due to hormonal changes, fluid retention, and altered connective tissue compliance.

Aim: To determine the prevalence and severity of CTS in pregnant women using electrodiagnostic evaluation and to compare clinical and electrodiagnostic findings.

Methodology: A hospital-based cross-sectional study was conducted at Department of obstetrics and gynecology, Shaheed Nirmal Mahto Medical College and Hospital, India, including 80 pregnant women across all trimesters. Participants underwent clinical assessment (Phalen's and Tinel's tests) and nerve conduction studies to confirm CTS and grade severity as mild, moderate, or severe.

Results: CTS was diagnosed electrodiagnostically in 16 women (20%), predominantly mild (56.2%). Symptomatic CTS (clinical and electrodiagnostic confirmation) occurred in 10 women (12.5%), mainly in the third trimester (80%), while subclinical CTS was present in 6 women (7.5%), mostly in earlier trimesters. Clinical tests alone were positive in 30 women (37.5%), highlighting moderate concordance with electrodiagnosis. CTS prevalence increased with gestational age, peaking in the third trimester.

Conclusion: CTS is relatively common during pregnancy, especially in the third trimester, with most cases being mild. Electrodiagnostic testing detects subclinical cases missed by clinical examination, emphasizing its role in early diagnosis and management to prevent symptom progression.

Keywords: Carpal Tunnel Syndrome, Pregnancy, Electrodiagnosis, Prevalence, Nerve Conduction Study, Trimester.

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Introduction

Carpal tunnel syndrome (CTS): This is popular entrapment neuropathy whose median nerve is compressed when passing through the carpal tunnel in the wrist resulting in a group of sensory and motor symptoms in the hand [1]. The syndrome is characterized by numbness, tingling, burning pains, and in advanced cases, weakness or atrophy of thenar muscles, most of which is limited to the thumb, index, middle and radial half of the ring finger. CTS is a major factor that leads to morbidity and functional disability among people with this condition, and the prevalence rate of CTS differs significantly among populations. The general prevalence of CTS in the United States is approximated to be 2.7, women were more prevalent than men with female-to-men ratios ranging between 3:1 to 10:1. In addition, bilateral involvement is frequent with clinical diagnosis showing bilateral involvement in 78 percent of cases and the electrodiagnostic diagnosis showing bilateral involvement in about 50 percent of patients [2].

The cause of CTS is many-fold, comprising repetitive motions of the wrist, systemic disorders, like diabetes mellitus and hypothyroidism, and structural deviations, making the carpal tunnel space smaller. One of these is the role played by pregnancy as a major physiological factor in the development or worsening of CTS. Pregnancy is a special condition because hormones, fluid retention and changes in connective tissue compliance may predispose women to median nerve compression in the carpal tunnel [3]. Since the majority of women go through pregnancy on several occasions in their reproductive

life, it is important to examine the effects of pregnancy on CTS in order to diagnose it early enough, treat it well to avoid the recurrence of the situations in the next pregnancies.

Patient-reported symptoms and physical examination maneuvers are considered the main methods of clinical assessment in CTS. The common diagnostic measures are Tinel sign, Phalen maneuver, and median nerve compression test, which are all meant to recreate or further worsen the symptoms of the patient to ascertain the diagnosis. The diagnostic accuracy of these tests is poor despite the fact that these tests are useful in clinical information. Electrodiagnostic testing is the gold standard in certifying CTS with nerve conduction and electromyography. Electrodiagnosis can objectively assess the activity of the median nerve, and the sensitivity of the method is 49-84% with a specificity of up to 95%. These are also used to not just confirm the existence of CTS, but also to determine its severity thus informing the decision to treat and prognosticate [4].

The treatment of CTS depends on the level of symptoms, time, and etiology. In the absence of risks associated with invasive interventions especially where the population is involved, non-invasive methods of treatment, including wrist splints, activity modification, and local physical therapy are favored. Corticosteroid injections, pharmacologic treatments and these are only used in cases of refractory or severe cases of the median nerve and surgical decompression is required. When it comes to the context of pregnancy, invasive treatment is in most instances contraindicated on the basis of maternal and fetal risks. Thus, this is especially significant in pregnant women so that non-invasive measures may be taken to prevent the disease or its complications and relieve the symptoms before they appear in the later pregnancies [5] because early diagnosis is essential to prevent the disease in later unfolding and its development.

Although CTS is clinically important in the course of pregnancy, the current studies have a number of limitations. Most of the earlier research that have examined CTS in pregnant women have based on clinical examination or non-standard diagnostic measures, which restricts the objectivity and generalizability of the results. Moreover, to a large extent, the literature has concentrated more on women at the third trimester in which the onset and severity of the symptoms are frequently the highest in the gestation period [6]. These studies are relevant, but they do not give a complete picture of CTS in all the stages of pregnancy, and they do not give the opportunity to determine the prevalence accurately in the whole gestation. Furthermore, differences in diagnostic criteria and methods have led to differences in reporting on prevalence and severity and made it even harder to interpret data and design standard treatment regimens.

In India, it is evident that there is a deficient specific epidemiology on CTS among pregnant women. This knowledge gap prevents clinicians adopting evidence-based approaches to early diagnosis and effective management. In response to it, the current research will identify the rate and severity of CTS among pregnant women through the standardized electrodiagnostic. The study aims to determine the changes in the frequency and severity of the symptoms in all three trimesters by assessing the participants in each trimester. Moreover, it discusses the comparison of prevalence of CTS found by physical examination and the one found with the help of electrodiagnosis and shows possible discrepancies and the need of objective diagnostics. Finally, the research will be used to inform clinical decision-making, assist timely non-invasive interventions, and help to achieve better maternal health outcomes under the circumstances of CTS during pregnancy.

Methodology

Study Design: This hospital-based descriptive cross-sectional study was conducted to determine the prevalence and severity of Carpal Tunnel Syndrome (CTS) among pregnant women using electrodiagnostic evaluation as the diagnostic gold standard. The study assessed both symptomatic and asymptomatic pregnant women attending routine antenatal care, without restriction based on maternal age, gestational age, or parity. The design was chosen to estimate the point prevalence of CTS and to categorize its severity during pregnancy.

Study Area: The study was carried out in the Department of Obstetrics and Gynecology at Shaheed Nirmal Mahto Medical College and Hospital (SNMMCH), Dhanbad, Jharkhand, India.

Study Duration: The study was conducted over a period of one year.

Sample Size: The total sample size for the study was 80 pregnant women (N = 80). The sample included participants who fulfilled the eligibility criteria and provided informed consent during the study period. The sample size was considered adequate to estimate the prevalence of CTS in the study population and to classify severity based on electrodiagnostic findings.

Sample Population: The study population comprised pregnant women attending routine antenatal check-ups at the obstetrics outpatient department. Participants were enrolled irrespective of gestational age, gravidity, parity, or presence of symptoms suggestive of CTS. Women were screened clinically and subsequently referred for electrodiagnostic evaluation to confirm or rule out CTS.

Data Collection: Data were collected using a predesigned and structured proforma. Detailed history was obtained regarding age, gestational age, obstetric history, and symptoms such as numbness,

tingling sensation, nocturnal pain, weakness, or paresthesia in the hands. Clinical examination included assessment with Phalen's test and Tinel's sign. All participants subsequently underwent electrodiagnostic testing, where sensory and motor distal latencies of the median and ulnar nerves were measured. Median nerve conduction velocity across the wrist was recorded using standard nerve conduction study (NCS) techniques. CTS was diagnosed based on established electrodiagnostic criteria comparing median nerve parameters with ulnar nerve values.

Inclusion Criteria

- Pregnant women attending antenatal clinic during the study period.
- Age between 18 and 45 years.
- Pregnancy without prior symptoms or diagnosis of CTS before conception.
- Willingness to participate and provide informed consent.

Exclusion Criteria

- History of trauma or fracture of the wrist/hand.
- Known hypothyroidism.
- Diabetes mellitus.
- Previously diagnosed peripheral neuropathy.
- Refusal to provide consent.

Procedure: After obtaining informed consent, eligible participants underwent detailed clinical evaluation in the antenatal clinic. Clinical tests for CTS, including Phalen's test and Tinel's sign, were performed. Participants were then referred for electrodiagnostic evaluation. Nerve conduction studies were conducted under standardized conditions, including controlled room temperature, to ensure accuracy. Surface electrodes were placed over the median and ulnar nerves to measure sensory and motor distal latency and nerve conduction velocity at the wrist. Based on electrodiagnostic findings, CTS severity was graded according to U.S. Electrodiagnostic Society criteria: mild (30–40 m/s), moderate (24–29 m/s), and severe (<24 m/s).

Statistical Analysis: All collected data were entered into Microsoft Excel and analyzed using SPSS version 16.0. Descriptive statistics such as mean and standard deviation were calculated for continuous variables, while frequency and percentage were used for categorical variables to determine the prevalence and severity distribution of CTS. The Mann–Whitney U test was applied where appropriate to compare clinical findings with electrodiagnostic results. Sensitivity and specificity of clinical tests were calculated using electrodiagnostic findings as the gold standard. A p-value of less than 0.05 was considered statistically significant."

Result

Table 1 summarizes the prevalence of carpal tunnel syndrome (CTS) among 80 pregnant women. Using electrodiagnostic criteria, 16 women (20.0%) were diagnosed, with 56.2% mild, 18.8% moderate, and 25.0% severe CTS. Clinical signs (Phalen/Tinel tests) were positive in 30 women (37.5%). Symptomatic CTS—meeting both clinical and electrodiagnostic criteria—was present in 10 women (12.5%), predominantly in the third trimester (80.0%), compared to 20.0% in the first and second trimesters. Subclinical CTS, detected only via electrodiagnosis, was seen in 6 women (7.5%), mostly in the first and second trimesters (66.7%), with fewer in the third trimester (33.3%). Overall, CTS was more common in the third trimester, with a mix of symptomatic and subclinical cases.

Table 1: Percentage of CTS in Pregnant Women (N = 80)

Criteria for CTS Diagnosis	Number (n)	Percentage (%)	Details
Electrodiagnostic criteria	16	20.00%	25.0% severe, 18.8% moderate, 56.2% mild
Clinical signs (Phalen/Tinel)	30	37.50%	Positive clinical tests
Both electrodiagnostic criteria and clinical signs (Symptomatic CTS)	10	12.50%	20.0% in 1st & 2nd trimester, 80.0% in 3rd trimester
Only electrodiagnostic criteria (Subclinical CTS)	6	7.50%	66.7% in 1st & 2nd trimester, 33.3% in 3rd trimester

Table 2 presents the trimester-wise distribution of carpal tunnel syndrome (CTS) diagnosed by electrodiagnosis among 80 pregnant women. In the first trimester, 2 out of 12 women (16.7%) had CTS; in the second trimester, 4 out of 28 women (14.3%) were affected; and in the third trimester, 10 out of 40 women (25.0%) had CTS. Overall, 16 women (20.0%) were diagnosed with CTS, with the highest prevalence observed in the third trimester.

Table 2: Trimester-wise Distribution of CTS (Electrodiagnostic Diagnosis) (N = 80)			
Trimester	**Total Women (n)**	**CTS Cases (n)**	**Percentage within Trimester (%)**
First Trimester	12	2	16.70%
Second Trimester	28	4	14.30%
Third Trimester	40	10	25.00%
Total	**80**	**16**	**20.0%**

Table 3 shows the severity of carpal tunnel syndrome (CTS) based on electrodiagnosis among 16 patients. Mild CTS (30–40 m/s) was the most common, seen in 9 patients (56.2%), followed by moderate CTS (24–29 m/s) in 3 patients (18.8%), and severe CTS (<24 m/s) in 4 patients (25.0%). Overall, more than half of the patients had mild electrodiagnostic findings.

Table 3: Severity of CTS Based on Electrodiagnosis (n = 16)		
Severity Category	**Number (n)**	**Percentage (%)**
Mild (30–40 m/s)	9	56.20%
Moderate (24–29 m/s)	3	18.80%
Severe (<24 m/s)	4	25.00%
Total	**16**	**100%**

Table 4 compares clinical findings with electrodiagnosis results in 80 patients (N = 80). Among those with positive clinical findings, 10 patients were also electrodiagnosis positive, while 20 were electrodiagnosis negative (total 30). In patients with negative clinical findings, 6 were electrodiagnosis positive and 44 were electrodiagnosis negative (total 50). Overall, electrodiagnosis identified additional cases not detected clinically, highlighting its complementary role in diagnosis.

Table 4: Comparison of Clinical Findings with Electrodiagnosis (N = 80)			
Parameter	**Electrodiagnosis Positive**	**Electrodiagnosis Negative**	**Total**
Clinical Positive	10	20	30
Clinical Negative	6	44	50
Total	**16**	**64**	**80**

Discussion

The results of the current research show that incidence of carpal tunnel syndrome (CTS) in pregnant women differs significantly based on the method of diagnosis that would be used. Electrodiagnostic test showed CTS in one out of five participants with more mild cases (56.2) and an absence of severe cases of CTS, as compared to clinical assessment which showed CTS in 37.5 percent of women only. In instances where the clinical and electrodiagnostic criteria were used in conjunction with one another, symptomatic CTS was discovered in 12.5% of the group, primarily in the third trimester. These findings are in line with the previous research indicating that electrodiagnostic examination is less effective in identifying the overall cases in comparison to clinical examination but more precise in identifying definite CTS. Indicatively, a prevalence of 7-43% was reported by Padua et al. (2010) [7] using electrodiagnostic criteria and 31-62 using clinical criteria and it was noted that clinical tests could overestimate CTS prevalence because symptoms are subjectively reported. Other studies, which have identified electrodiagnosis as the only outcome, have reported higher rates, including 28% and 43% in the third trimester (Ordbieg, 1987; Pazzaglia, 2005) [6,8] and even up to 62% overall (Ablove & Ablove, 2009) [9] which is also variable and might be based on sample size, gestational distribution, or diagnostic thresholds."

Another interesting observation made during the study was that CTS is more prevalent as gestational age advances. Those diagnosed during the first trimester through the electro diagnostic testing were only 16.7% and only increased to 14.3 in the second trimester and eventually reached 25% in the third trimester. This trend is widely representative of Shaafi et al. (2006) [10] who reported an increase in CTS prevalence between the early and late periods of pregnancy and highest prevalence was found during the third trimester. In the same manner, Padua et al. (2001) [11] reported the prevalence in the third trimester at 26.6% asserting that gestational age is a crucial factor in the presentation of the CTS symptoms. Conversely, there are studies that report a more homogenous distribution of CTS by trimester, for example a report by Tabriz, Iran, which reported 32% 32% and 35% in trimester one, two, and three respectively (Shaafi et al., 2006) [10], implying that some population features and study design can affect trimester-specific prevalence rates.

The intensity of CTS in our research was mainly mild with 25% women having severe and 18.8 moderate cases. Severe CTS was realized only during the

third trimester and supports the idea that the period of pregnancy affects the development of symptoms. This result is in line with the other reports that mild CTS is the most widespread manifestation in pregnant population (Shaafi et al., 2006) [10]. Nonetheless, other studies have shown greater rates of severe or symptomatic cases with one showing that 50% of the cases that presented with clinical symptoms during the third trimester were found to be electrodiagnostically confirmed of CTS (Padua et al., 2001) [11], and another one showed that 80% of diagnosed cases were asymptomatic (Atisook et al., 1995) [12]. Such differences help to underline the fact that the general trend of rising severity with gestation is universal, but the ratio of asymptomatic to symptomatic CTS can be different across various studies based on the design and the level of diagnostic rigor.

One of the most important comments in our research was a moderate agreement between electrodiagnosis and clinical examination. Ten women were positive in both tests; 20 women were positive in clinical symptoms but negative in electrodiagnostic tests and six women were positive in electrodiagnostic tests but negative in clinical symptoms. This is in agreement with the idea that electrodiagnostic testing is more sensitive to identifying subclinical CTS, particularly in early pregnancy cases when 42% of our cohort consisted of asymptomatic cases. Ordbieg (1987) [6] and Pazzaglia (2005) [8] have also pointed out that subclinical CTS is prevalent among pregnant women, and it may even go undetected unless through electrodiagnosis. Conversely, the use of clinical criteria alone may either overestimate the prevalence or fail to detect mild, subclinical cases, resulting in possible misclassification (Padua et al., 2010) [7]. These results justify the suggestion to perform early electrodiagnostic screening, especially of women during the first and second trimesters, in order to detect subclinical CTS before it becomes symptomatic.

The discrepancy between symptomatic presentation and electrodiagnostic confirmation, as observed is a reminder of the importance of interpretation of clinical data, as well as electrophysiological data. Although other studies confirm a high percentage of symptomatic pregnant women not responding to electrodiagnostic criteria (Atisook et al., 1995) [12] have others indicating a maximum of one-third of symptomatic cases have definitive electrodiagnostic evidence (Padua et al., 2001) [11]. This variance can indicate variability in patient groups, testing procedure or symptom description. Furthermore, the fact that CTS symptoms persisted after pregnancy, reported in more than 50 per cent of the cases at one year and in 30 per cent at three years of postpartum (Padua et al., 2010) [7] indicates that early diagnosis and follow-up would be crucial to avoid the long-term consequences, though the postpartum follow-up was not covered by our study.

Altogether, the current research supports the existing evidence which points to the fact that CTS is the most common during the third trimester, mild in nature and in most cases, it is subclinical during pregnancy. The use of comparisons with other studies proves both similarity of the gestational pattern of prevalence and severity in the existing cases and contradiction in both the proportion of symptomatic and asymptomatic cases, which supports the importance of electrodiagnostic assessment as a valid device of diagnosing and early intervention.

Conclusion

The paper emphasizes that the carpal tunnel syndrome (CTS) is a rather prevalent disorder among pregnant women, and a significant percentage of them has both clinical and electrodiagnostic signs. The CTS rate seems to rise with pregnancy with the highest rate occurring in the third trimester. Although a reduced population of women proved to be subclinical CTS which can only be detected through electrodiagnostic CTS, a greater number of women had symptomatic CTS which had been confirmed through clinical manifestation and electrodiagnosis. The level of CTS was mild, moderate and severe in most cases, indicating a range of nerve involvement during pregnancy. Also, having made a comparison between clinical results and electrodiagnostic results, there was incongruency, meaning that use of clinical evaluation alone might fail to capture the actual burden of CTS. On the whole, the results suggest that the CTS in pregnant women requires close attention, especially, at the end of the pregnancy, in order to provide the opportunity to diagnose and treat the condition on time and avoid the aggravation of the symptoms, which may negatively affect daily activity and quality of life.

References

1. Johnson EW, Hennessey WJ. Carpal tunnel syndrome. In: Johnson EW, Pease WS, editors. Practical electromyography. 3rd ed. USA: Williams & Wilkins; 1997. p. 195-8.
2. Dumitru D, Zwarts MJ. Focal peripheral neuropathy. In Dumitru D, Zwarts MJ, Amanto AA, editors. Electrodiagnostic medicine. 2nd ed. Philadelphia: Hanley & Belfus; 2002. p. 1047-126.
3. Szabo RM, Madison M. Carpal tunnel syndrome. Orthop Clin North Am 1992; 123:109-30.
4. McLennan HG, Oats JN, Walstab JE. Survey of hand symptoms in pregnancy. J Med Aust 1987; 147:542-8.
5. Stolp-Smith KA, Pascoe MK, Ogburn PL. Carpal tunnel syndrome in pregnancy: frequency, severity, and prognosis. Arch Phys Med Rehabil 1998; 79:1285-7.

6. Ordbieg G. Carpal tunnel syndrome in pregnancy. Acta Obstet Gynecol Scand 1987; 66:235-7.
7. Padua L, Pasquale A, Pazzaglia C, Liotta GA, Librante A, Mondelli M. Systematic review of pregnancy-related Carpal tunnel syndrome. Muscle Nerve 2010; 42:697-702.
8. Pazzaglia CC. Multicenter study on carpal tunnel syndrome and pregnancy incidence and natural course. Asta Neuro Chir Suppl 2005; 92:35-9
9. Ablove RH, Ablove TS. Prevalence of carpal tunnel syndrome in pregnant women. WMJ 2009; 108:194-6.
10. Shaafi SH, Naimian Sh, Iromlou H, Sayyah Melli M. Prevalence and severity of carpal tunnel syndrome (CTS) during pregnancy based on electerophysiology studies. Shiraz E-Med J 2006;7:177-81
11. Padua L, Pazzaglia C, Mondelli M, Liotta GA. Symptoms and neurophysiological picture of carpal tunnel syndrome in pregnancy. Clin Neurophysiol J 2001; 112:1946-51.
12. Atisook R, Benjapibal M, Sunsaneevithayakal P, Roongpisuthipoog A. Carpal tunnel syndrome during pregnancy, prevalence and blood level of pyridoxine. J Med Assoc Thailand 1995; 78:410-4