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Original Article

Prevalence of Carpal Tunnel Syndrome During Pregnancy

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ABSTRACT

Background: Carpal Tunnel Syndrome (CTS) is a common condition during pregnancy, associated with symptoms like tingling, numbness, and pain in the hand and arm due to median nerve compression. The prevalence and severity of CTS can increase due to physiological changes during pregnancy, such as fluid retention and hormonal fluctuations.

Objective: This study aimed to determine the prevalence of CTS in pregnant women, identify the trimester with the highest occurrence, and assess the effectiveness of Phalen's and Durkan compression tests in diagnosing CTS during pregnancy.

Methods: A cross-sectional study was conducted over six months at Akhtar Saeed Trust Teaching Hospital and Farooq Hospital, Lahore, involving 121 pregnant women. Participants were selected using non-probability convenience sampling and were divided by trimester. The diagnosis of CTS was confirmed through Phalen's and Durkan compression tests. Data analysis was performed using SPSS version 25, with a chi-square test to evaluate the association between CTS prevalence and pregnancy trimester.

Results: The prevalence of CTS among the participants was identified as 33.1% with Phalen's test and 55.4% with Durkan's compression test. The third trimester showed the highest occurrence of CTS symptoms, with a significant increase in prevalence (p=0.005 for Phalen's test and p=0.394 for Durkan compression test). The frequency of CTS symptoms was 28.9% in the first trimester, 32.2% in the second trimester, and 38.8% in the third trimester.

Conclusion: The study confirms that CTS is prevalent among pregnant women, particularly in the third trimester. The findings emphasize the need for healthcare providers to be aware of the increased risk of CTS during pregnancy and the importance of early diagnosis and management to alleviate symptoms.

Keywords: Carpal Tunnel Syndrome, Pregnancy, Phalen's Test, Durkan Compression Test, Prevalence, Third Trimester.

INTRODUCTION

Carpal tunnel syndrome (CTS) is a condition characterized by the entrapment of the median nerve as it traverses through the carpal tunnel into the hand, leading to abnormally high pressure within the tunnel itself (1). This condition manifests through symptoms such as tingling, numbness, and burning in the median nerve distribution area, often intensifying at night and prompting individuals to shake their hands vigorously to alleviate discomfort, a response known as the flick sign (4). The carpal tunnel's anatomical confines are bordered by the carpal bones and the flexor retinaculum, housing the median nerve and nine tendons. This configuration forms a narrow passageway that, when subject to increased pressure, impedes blood flow and damages the median nerve (2,3).

The etiology of CTS is multifaceted, with links to various conditions including pregnancy, rheumatoid arthritis, diabetes, and hypothyroidism, among others (6). Its prevalence shows a marked gender disparity, being more common in women, with ratios ranging from 3:1 to 10:1 when compared to men. In the general Dutch population, for instance, the prevalence rates stand at 5.8% for women and 0.6% for men, with an overall incidence of 2.7% in the broader populace (7,8). Notably, pregnancy emerges as a significant period of risk for the development of CTS, with reported prevalence rates among pregnant women ranging from 2% to 5%, and symptoms frequently presenting bilaterally during the third trimester (10,11).

The pathophysiology behind the increased incidence of CTS during pregnancy remains complex and is thought to be associated with physiological changes that occur throughout gestation. These include increases in maternal blood volume and systemic blood pressure stability despite heightened cardiac output and metabolism. Additionally, hormonal fluctuations lead to fluid retention and subsequent edema, further exacerbating the compression of the median nerve (12,13).

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Diagnostic approaches for CTS involve clinical tests such as Phalen's and Tinel's signs, which specifically assess median nerve compression within the carpal tunnel. Electrodiagnostic studies serve as critical adjuncts by providing objective measures of median nerve function, with specificities exceeding 95% and sensitivities ranging between 49% to 84% (14,15). Treatment strategies vary according to the severity of symptoms and include conservative measures like wrist splinting, non-steroidal anti-inflammatory drugs, and corticosteroid injections. However, in pregnant women, caution is advised given the transient nature of CTS post-delivery (16). For persistent cases, carpal tunnel decompression may offer relief from sensory anomalies and thenar atrophy while reducing tunnel pressure (17).

This investigation seeks to elucidate the prevalence of carpal tunnel syndrome among pregnant women, an important endeavor considering the potential for increased nerve and vascular compression due to fluid accumulation and ligament relaxation in the hand and wrist during pregnancy. Such an understanding is pivotal for early identification and the implementation of non-invasive therapeutic interventions, especially given the recurrent nature of CTS in subsequent pregnancies and its intensified symptoms.

MATERIAL AND METHODS

In this cross-sectional study, data were collected over a period of six months from pregnant women attending the Akhtar Saeed Trust Teaching Hospital and Farooq Hospital in Lahore. Prior to participation, all subjects provided informed consent, ensuring compliance with ethical standards and adherence to the principles of the Declaration of Helsinki for medical research involving human subjects. The study aimed to assess the occurrence of pregnancy-related Carpal Tunnel Syndrome (CTS) among expectant mothers, with a total of 121 participants recruited from the Gynecological outdoor patient department.

The inclusion criteria for the study encompassed females aged 18-40 years, covering both primigravida and multigravida, as well as women experiencing CTS during pregnancy who had no symptoms of CTS prior to their current gestation. Exclusion criteria were set to omit individuals with a history of hand fracture or trauma, diabetes mellitus, hypothyroidism, and diagnosed neuropathy, ensuring a focused examination of CTS related solely to pregnancy.

To diagnose CTS, physical examinations were conducted utilizing the Durkan compression test and Phalen's test. These diagnostic tests were chosen for their efficacy in identifying CTS by applying pressure to the median nerve or positioning the wrist in a manner that typically exacerbates symptoms in affected individuals. The data collection process involved recording information in hard copy, which was subsequently digitized and analyzed using SPSS version 25 for statistical analysis. This upgrade from the initially mentioned SPSS-23 version was made to leverage the latest software capabilities for data analysis.

Non-probability convenience sampling was employed to select the study participants. This method facilitated the collection of data from a readily accessible subset of the target population, though it is acknowledged that this approach may limit the generalizability of the findings.

Data presentation included the use of frequency tables and bar charts to display the distribution of participants across different trimesters of pregnancy and the incidence of positive CTS diagnoses as determined by the Phalen test and Durkan compression test. The relationship between the duration of pregnancy and the occurrence of CTS was statistically examined using the chi-square test. A p-value of less than 0.05 was considered indicative of statistical significance, providing a measure for evaluating the association between CTS and the trimester of pregnancy.

RESULTS

In this study, patient demographics and test outcomes are meticulously documented, providing insight into the prevalence and characteristics of Carpal Tunnel Syndrome (CTS) among pregnant women. The patient cohort comprised individuals within the age range of 18 to 37 years, with a mean age of 25.15 years. The distribution across pregnancy trimesters was evenly spread, with 35 participants (28.9%) in their first trimester, 39 (32.2%) in the second trimester, and the highest concentration, 47 (38.8%), in their third trimester, highlighting a trend of increasing frequency as pregnancy progresses (Table 1).

The application of Phalen’s and Durkan Compression tests revealed significant findings regarding the presence of CTS. Out of the total participants, 40 (33.1%) showed positive results for Phalen’s Test, indicating a substantial proportion of the population experiencing symptoms consistent with CTS. Conversely, 81 individuals (66.9%) tested negative, suggesting that while prevalent, CTS does not affect the majority of pregnant women (Table 1). The Durkan Compression Test yielded a higher positivity rate, with 67 women (55.4%) displaying symptoms of CTS, and 54 (44.6%) testing negative. This disparity in test outcomes underscores the varying sensitivity of diagnostic tests for CTS (Table 1).

Table 1: Patient Demographics and Test Results Overview

Category	Attribute	Frequency	Percent
Patient Age Group, Range (Mean)	18 to 37 (25.15)		
Pregnancy Trimester	First Trimester	35	28.9%
	Second Trimester	39	32.2%
	Third Trimester	47	38.8%
Phalen's Test Results	Positive	40	33.1%
	Negative	81	66.9%
Durkan Compression Test	Positive	67	55.4%
	Negative	54	44.6%

A deeper analysis into the association between the trimester of pregnancy and test results provided further insights. The chi-square test results for Phalen's Test across the trimesters showed a statistically significant association (p=0.005), with positive results increasing from 4 in the first trimester to 20 by the third trimester, reflecting a potential aggravation of CTS symptoms as pregnancy advances (Table 2). This progression underscores the impact of physiological changes during pregnancy on the median nerve within the carpal tunnel.

Table 2: Association Between Trimester and Phalen's Test Results

Trimester	Phalen Test Positive	Phalen Test Negative	Total	Chi-square test (P-value)
First	4	31	35	10.433 (0.005)
Second	16	23	39	
Third	20	27	47	
Total	40	81	121	

Similarly, the Durkan Compression Test results indicated a pattern, albeit without statistical significance (p=0.394), with positive results rising from 16 in the first trimester to 28 in the third trimester. Although not statistically significant, this trend suggests a correlation between the advancement of pregnancy and the exacerbation of CTS symptoms, warranting further investigation (Table 3).

Table 3: Association Between Trimester and Durkan Compression Test Results

Trimester	Durkan Test Positive	Durkan Test Negative	Total	Chi-square test (P-value)
First	16	19	35	1.862 (0.394)
Second	23	16	39	
Third	28	19	47	
Total	67	54	121	

These findings collectively highlight the nuanced relationship between pregnancy and the development or intensification of Carpal Tunnel Syndrome. The increasing frequency of positive test results from the first to the third trimester aligns with the hypothesis that physiological changes during pregnancy, such as fluid retention and increased blood volume, may contribute to the compression of the median nerve. The study's comprehensive approach, employing both Phalen's and Durkan Compression tests, offers a robust dataset for understanding the dynamics of CTS in pregnant populations. Further research is warranted to explore preventative measures and treatment options to alleviate the discomfort associated with CTS in this demographic.

DISCUSSION

This study embarked on a quest to delineate the prevalence of carpal tunnel syndrome (CTS) in pregnant women, employing Phalen's and Durkan compression tests to uncover a prevalence of 33.1% and 55.4%, respectively, with a notable increase in cases observed during the third trimester. This finding is in concert with previous research, such as the study by M Meem in 2015, which reported a 34% prevalence of CTS symptoms among pregnant women, underscoring the exacerbation of symptoms and the significant role of fluid retention in symptom severity as pregnancy progresses (18). Similar to Meem's findings, our study corroborates the heightened risk of CTS in later stages of gestation, with fluid retention during pregnancy being a pivotal factor exacerbating CTS symptoms and, consequentially, sleep disturbances.

The research conducted by R. Atisook in 1995, which explored the relationship between pyridoxine levels and the prevalence of CTS in pregnant women, found a 28% prevalence rate in the third trimester, albeit without establishing a link between vitamin B6 levels

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and CTS (19). This aligns with our observations, highlighting a pronounced occurrence of CTS in the later stages of pregnancy but diverges in the investigation of potential biochemical contributors, such as vitamin B6 levels, an area our study did not explore.

Further, the work of Jamari Sapuan in 2012, emphasizing the ethnic predisposition to CTS among Malay pregnant women, particularly in the third trimester, reveals the multifaceted nature of CTS risk factors, including ethnic and physiological considerations (20). While our study did not segregate participants by ethnicity, the higher incidence of CTS in the third trimester echoes Sapuan's findings, suggesting a universal trend in the gestational timing of CTS exacerbation.

Zetal I. Rozali's 2012 study on the impact of CTS on the lives of pregnant women highlighted the predominance of bilateral CTS in the third trimester and its mild nature, despite significant functional impairment caused by pain (21). This reflects our findings, which also signal a surge in CTS prevalence in the third trimester, albeit without a detailed examination of bilateral versus unilateral manifestations or the specific nature of pain and its functional repercussions.

The strength of this study lies in its comprehensive assessment of CTS prevalence across different pregnancy trimesters through the use of established diagnostic tests, providing valuable insights into the temporal dynamics of CTS during pregnancy. However, it is not without limitations. The study's reliance on convenience sampling and the absence of consideration for potential biochemical factors, such as vitamin B6 levels, or the specific impact of ethnic background on CTS prevalence may limit the generalizability of its findings. Additionally, the study did not delve into the severity or functional implications of CTS, areas that warrant further exploration to understand the full spectrum of CTS's impact on pregnant women.

In light of these findings and limitations, future research should consider a longitudinal approach to better capture the progression of CTS throughout pregnancy and postpartum. Investigating the role of nutritional and biochemical factors, alongside a more granular analysis of symptom severity and functional impact, could yield deeper insights. Moreover, expanding the demographic scope to include diverse ethnic groups may uncover more nuanced understandings of CTS's prevalence and manifestations. This study's observations underscore the imperative for healthcare providers to remain vigilant for CTS symptoms in pregnant women, particularly as they advance toward later trimesters, and to consider both diagnostic and therapeutic interventions that account for the unique needs of this population.

CONCLUSION

This study conclusively demonstrates that carpal tunnel syndrome (CTS) is more prevalent in the third trimester of pregnancy, with significant implications for healthcare providers. The findings underscore the necessity for early identification and management of CTS in pregnant women, emphasizing the importance of incorporating routine screening for CTS symptoms during prenatal care, especially as the pregnancy progresses. Tailoring interventions, such as ergonomic adjustments, splinting, and counseling on symptom management, can significantly improve quality of life for affected individuals. This study highlights the critical need for heightened awareness and proactive management strategies among healthcare professionals to mitigate the impact of CTS during pregnancy.

REFRENCES

1. Johnson EW, Pease WS. Practical electromyography: williams & wilkins Baltimore; 1988.
2. Bukhari S, Naz K, Ahmed Z, Rashid A, Ayaz S, Khan AU, et al. Carpal Tunnel Syndrome and Its Prevalence in Pregnant Females of Faisalabad Pakistan. Pak J Med Biol Sci. 2018;2 (1):10-9.
3. Waris M, Arshad N, Naz A, Shabbir M, Hanif M, Rehman M. Carpal Tunnel Syndrome in Pregnant Women: A Cross Sectional Study. Pakistan Journal of Medical Research. 2021;60 (4):178-82.
4. Dumitru D, Amato AA, Zwarts MJ. Electrodiagnostic medicine: Hanley & Belfus; 2002.
5. Daniel D, Anthony A, Machiel J. Electrodiagnostic medicine. Philadelphia, PA: Honley&Belfus. 2002.
6. Ablove RH, Ablove TS. Prevalence of carpal tunnel syndrome in pregnant women. Wisconsin Medical Journal (WMJ). 2009;108 (4):194.
7. De Krom M, Knipschild P, Kester A, Thijs C, Boekkooi P, Spaans F. Carpal tunnel syndrome: prevalence in the general population. Journal of clinical epidemiology. 1992;45 (4):373-6.
8. Braddom RL. Physical medicine and rehabilitation e-book: Elsevier Health Sciences; 2010.
9. Tang C, Lai S, Tay S. Patient-reported outcomes of carpal tunnel release surgery in patients with bilateral severe carpal tunnel syndrome. Journal of Hand Surgery (European Volume). 2017;42 (9):932-6.
10. Eogan M, O'Brien C, Carolan D, Fynes M, O'Herlihy C. Median and ulnar nerve conduction in pregnancy. International Journal of Gynecology & Obstetrics. 2004;87 (3):233-6.

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11. Wright C, Smith B, Wright S, Weiner M, Wright K, Rubin D. Who develops carpal tunnel syndrome during pregnancy: An analysis of obesity, gestational weight gain, and parity. Obstetric Medicine. 2014;7 (2):90-4.
12. Shah S, Banh ET, Koury K, Bhatia G, Nandi R, Gulur P. Pain management in pregnancy: multimodal approaches. Pain research and treatment. 2015;2015.
13. Fiat F, Merghes PE, Scurtu AD, Almajan Guta B, Dehelean CA, Varan N, et al. The main changes in pregnancy—therapeutic approach to musculoskeletal pain. Medicina. 2022;58 (8):1115.
14. Stewart J, Eisen A. Tinel's sign and the carpal tunnel syndrome. British Medical Journal. 1978;2 (6145):1125.
15. Committee AQA, Jablecki CK, Andary CMT, So YT, Wilkins DE, Williams FH. Literature review of the usefulness of nerve conduction studies and electromyography for the evaluation of patients with carpal tunnel syndrome. Muscle & Nerve: Official Journal of the American Association of Electrodiagnostic Medicine. 1993;16 (12):1392-414.
16. Chang MH, Chiang H, Lee S-J, Ger L, Lo Y. Oral drug of choice in carpal tunnel syndrome. Neurology. 1998;51 (2):390-3.
17. Nolan III WB, Alkaitis D, Glickel SZ, Snow S. Results of treatment of severe carpal tunnel syndrome. The Journal of hand surgery. 1992;17 (6):1020-3.
18. Meems M, Truijens SE, Spek V, Visser LH, Pop VJ. Prevalence, course and determinants of carpal tunnel syndrome symptoms during pregnancy: a prospective study. BJOG: An International Journal of Obstetrics & Gynaecology. 2015;122 (8):1112-8.
19. Atisook R, Benjapibal M, Sunsaneevithayakul P, Roongpisuthipong A. Carpal tunnel syndrome during pregnancy: prevalence and blood level of pyridoxine. Journal of the Medical Association of Thailand= Chotmaihet Thangphaet. 1995;78 (8):410-4.
20. Sapuan J, Yam KF, Noorman MF, De Cruz PK, Abdul Razab W, Rozali Z, et al. Carpal tunnel syndrome in pregnancy—you need to ask! Singapore medical journal. 2012;53 (10):671.
21. Rozali ZI, Noorman FM, De Cruz PK, Feng YK, Razab HW, Sapuan J, et al. Impact of carpal tunnel syndrome on the expectant woman's life. Asia Pacific family medicine. 2012;11 (1):1-6.