

RESEARCH ARTICLE

Incidence of pregnancy-related carpal tunnel syndrome with advancement of parity

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ABSTRACT

Background: Pregnant women are at a risk of developing carpal tunnel syndrome (CTS). It is the most common mononeuropathy of the median nerve which is at risk of compression due to its location. The median nerve is present in the carpal tunnel at the wrist joint level. The median nerve gets compressed which leads to its hampered conduction, affecting the conduction velocity and latency of the nerve adversely as recorded by the electrodiagnostic technique. The chances of compression of the nerve are increased with the number of pregnancies a female goes through in the reproductive span of her life. **Aims and Objectives:** The aim of the study was to analyze any positive association between parity status and incidence of pregnancy-related CTS (PRCTS) in pregnant women. **Materials and Methods:** In this cross-sectional study, 75 pregnant females, recruited from the obstetrics ANC clinic JNMCH, AMU were screened for PRCTS through the electrodiagnostic technique in the neurophysiology laboratory, Department of Physiology, JNMCH, AMU. Out of these 75 pregnant females, 36 (48%) were found to be positive for PRCTS. **Results:** Among the 36 PRCTS-positive pregnant females, 26 were found to be multiparous, whereas 10 were primiparous. **Conclusion:** The study found a very strong association (statistically significant) of multiparous pregnant females with PRCTS.

KEY WORDS: Pregnancy; Pregnancy Related Carpal Tunnel Syndrome; Parity; Electrodiagnostic Technique

INTRODUCTION

Carpal tunnel syndrome (CTS) is a very steady cause of neuropathy affecting mostly median nerve.^[1,2] Among all neuropathies, CTS contribution is 90%.^[3] About 4%–5% of the population is affected. Females show a much higher rate of prevalence (9.2%) than males (6%). The younger age group is involved in both groups.^[1,4]

Physiological evidences suggested it is increased pressure inside the carpal tunnel leads to derangement of median nerve functioning.^[5,6] One study on industrial worker describes the several risk factors which favors the pathogenesis of CTS such as female gender, age, obesity, and smoking.^[7,8] Secondary CTS is caused by many factors which may be extrinsic or intrinsic. Extrinsic factors result in abnormalities in the space of the carpal tunnel which, in turn, increase the risk of CTS. Among these factors, some increase the volume of synovial sheath in the carpal tunnel space which leads into CTS; such as hypothyroidism, obesity, pregnancy, menopause, renal failure, use of oral contraception pills, and congestive heart disease.^[9,10]

CTS in Pregnancy

During pregnancy maternal blood profile gets altered which leads to initiate CTS. In the last half of pregnancy, the blood

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volume enhanced by 30% above normal level. Simultaneously levels of estrogen, progesterone, and aldosterone are highly increased which supporting the causation of the syndrome. Kidney's play a role in enhancing blood volume by increasing fluid retention. In addition, in pregnancy, red bone marrow is in a more active state comparatively producing more blood cells favoring enhanced blood volume. Therefore, 1–2 L extra blood is circulated in mother at the time of delivery.^[11] In addition to pregnancy, there are several other causes which lead into altered fluid balance such as obesity, menopause, eclampsia, long-term hemolysis, renal failure, hypothyroidism, LE, Raynaud's disease, amyloidosis, scleroderma, and Peget's disease so these conditions have to exclude in the study population. Among the described several causes of altered blood volume, pregnancy is the most remarkable cause of CTS.^[12] Since almost all the female go through childbearing more than once in their life, a research that studies the causes and aggravating factors of CTS can be of value.^[13] The incidence of CTS is higher in females during their pregnancy and lactation state. As the pregnancy progresses and the parity of women enhances, the severeness of CTS enhances. For early detection of CTS can be done by non-invasive methods, since invasive procedures are prohibited during pregnancy.^[14] Pregnancy-related CTS (PRCTS) is a kind of most recurrent mononeuropathy. The incidence of PRCTS has a broad range up to 70% of cases of pregnancy. Its diagnosis is also depends upon the technique employed. The pathophysiology of PRCTS is fluid deposition under the influence of hormonal fluctuation during pregnancy.^[15] The reported factors that favor the initiation of symptoms in PRCTS are glucose level alteration, edema, and hypersensitivity of the nerve involved. Hence, the diagnosis of PRCTS in the general population is similar to the diagnosis of carpal tunnel syndrome.^[16] The diagnosis of PRCTS is consist of a history of complaints, associated symptoms, general physical examination, and required investigations.^[15] In comparison of idiopathic CTS, PRCTS has raised the frequency of painful diurnal symptoms. PRCTS prevalence occurs in both primi and multiparous. The incidence of PRCTS increases as pregnancy advances.^[17] These facts make the reason for doing the study of PRCTS which is of paramount importance in not just in the general population but in the pregnant females as well.

Aims and Objectives

The aim of the study was to analyze any positive association between the parity status and incidence of PRCTS in pregnant women.

MATERIALS AND METHODS

In this cross-sectional study, 75 pregnant females, recruited from the obstetrics ANC clinic JNMCH, AMU, aged in between 20 and 35 years, were screened for PRCTS through the

electrodiagnostic technique in the neurophysiology laboratory, Department of Physiology, JNMCH, AMU. Out of these 75 pregnant females, 36 were found to be positive for PRCTS.

Inclusion Criteria

The following criteria were included in the study:

- No symptoms of CTS in pregnant females before pregnancy
- Pregnant women whom are asymptomatic but follows the CTS diagnosis criteria
- The presence of signs and symptoms of CTS in pregnant females starts after the beginning of pregnancy.

Exclusion Criteria

Pregnant women were excluded from the study whom have following conditions

- Hypothyroidism, any previously diagnosed neuropathy or any autoimmune diseases, diabetes
- Obese, smoker pregnant women.

Electrodiagnostic Studies (EDX)

These EDXs study measures the latency, amplitude, and nerve conduction velocity of the sensory and motor part of the median nerve.^[10] This study is a very sensitive, gold standard in the diagnosis of CTS. The abnormal supposed values are sensory latency >3.5 ms and distal motor latency >4.5 ms.^[18]

Sample Size

The sample size is calculated on the basis of the prevalence of PRCTS in Asian population (26%)^[19] and absolute error (10%) which is about 72 so we enrolled 75 pregnant females.

Statistical Analysis

Microsoft Office Excel 2013 was used for enumeration of data. Statistics is a statistical software suite (SPSS) version 20.0, statistical package for Windows (SPSS, Chicago, IL) was utilized for the evaluation of data. Mean $\pm$ Standard deviation or range was a continuous variable and percentage signifies qualitative data. The Chi-square test was used to find any statistically significant association between parity status and prevalence of PRCTS.

Ethics Committee Approval

The study protocol was approved from the Institutional Ethical Committee, Faculty of Medicine, AMU, Aligarh. (D. No- 1660/FM, Dated July 07, 2021).

Informed Consent

Informed consent was taken from all the participants before enrollment in the study.

RESULTS

The study population was 75 pregnant females, in which 36 (48%) were found to be PRCTS-positive [Figure 1] among the 36 PRCTS-positive pregnant females, 26 were found to be multiparous, whereas 10 were primiparous. The study found a very strong association (statistically significant) of multiparous pregnant females with PRCTS ($P < 0.05$). Figure 2 shows the parity distribution of the PRCTS-positive pregnant females. Out of 36 diagnosed cases of PRCTS, 26 were found to be multiparous and only 10 were primiparous. Figure 3 shows the incidence of PRCTS in the primiparous pregnant female. Out of the total 41 primiparous pregnant females included in the study, 10 were diagnosed as PRCTS-positive, which was 24.39% of the total primiparous pregnant females. The incidence of PRCTS diagnosed in the multiparous pregnant females is 76%. Figure 4 shows the percentage of multiparous females diagnosed as PRCTS-positive. Out of the total 54 multiparous females included in our study, 26 were diagnosed as PRCTS-positive. About 48.14% of

multiparous pregnant females were diagnosed as positive cases of PRCTS [Table 1]. Thus, an electrodiagnostic study has greater positivity in multiparous pregnant females than primiparous.

DISCUSSION

The present study is based on observation of PRCTS among pregnant females of different parity. The study population was 75 pregnant females, in which 36 (48%) were found to be PRCTS positive. Among the 36 PRCTS-positive pregnant females, 26 were found to be multiparous, whereas 10 were primiparous. The study found a very strong association (statistically significant) of multiparous pregnant females with PRCTS ($P < 0.05$).

Out of the total 41 primiparous pregnant females included in the study, 10 were diagnosed as PRCTS positive, which was 24.39% of the total primiparous pregnant females and 76% of PRCTS-positive pregnant females were multiparous (34). Out of the total 54 multiparous females included in

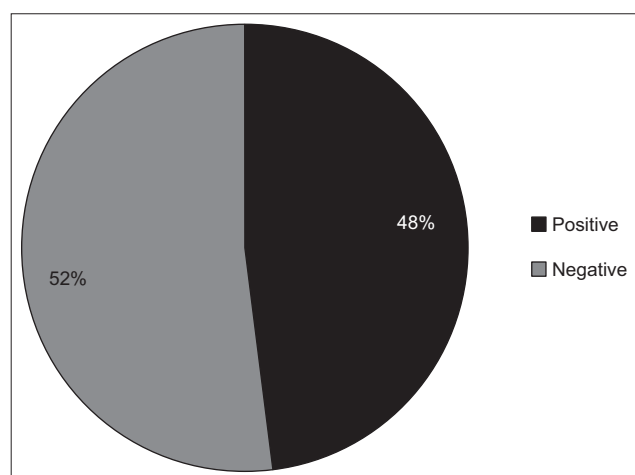


Figure 1: The pregnancy-related carpal tunnel syndrome incidence among the 75 recruited pregnant women

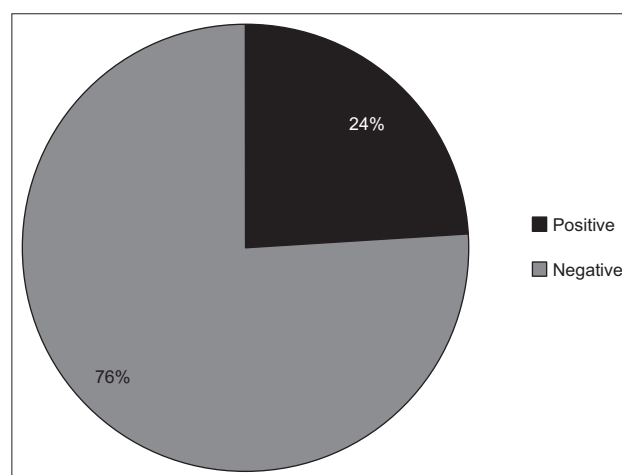


Figure 3: Incidence of pregnancy-related carpal tunnel syndrome in the primiparous pregnant female

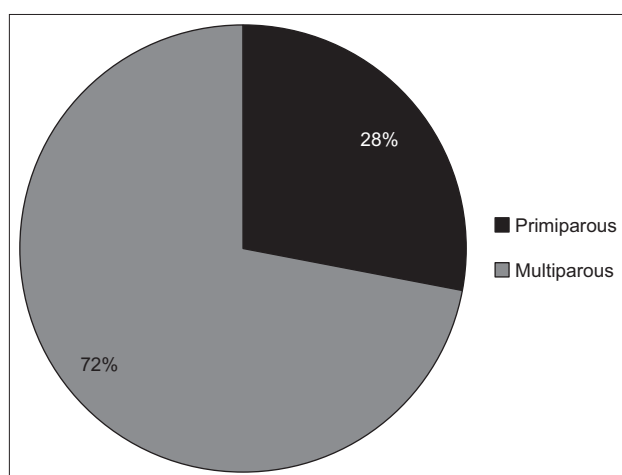


Figure 2: Parity distribution of the pregnancy-related carpal tunnel syndrome-positive pregnant females

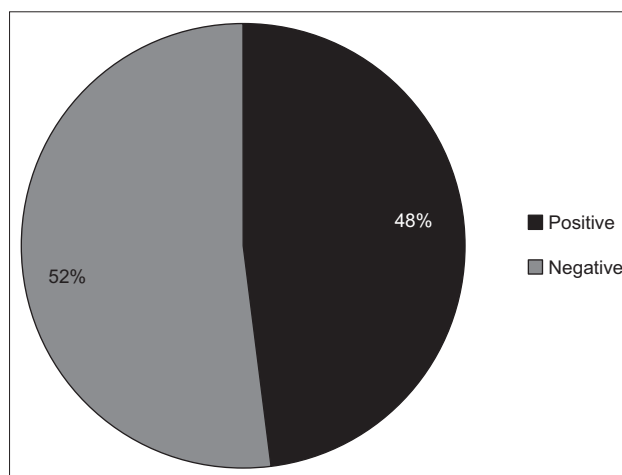


Figure 4: Percentage of multiparous females diagnosed as pregnancy-related carpal tunnel syndrome positive

Table 1: Chi-square test depicting the association of parity with the incidence of pregnancy-related carpal tunnel syndrome

Groups	PRCTS-positive	PRCTS negative	Total	Chi-square statistic	P-value
Primiparous	10	23	33	7.394	0.007
Multiparous	26	16	42		
Total	36	39	75		

PRCTS: Pregnancy-related carpal tunnel syndrome

our study, 26 were diagnosed as PRCTS positive. About 48.14% of multiparous pregnant females were diagnosed as positive cases of PRCTS. Thus, an electrodiagnostic study has greater positivity in multiparous pregnant females than primiparous.

The finding of increased incidence of PRCTS among the multiparous recruited population is supported by a study done by Ferry *et al.*,^[20] which reported a higher incidence of PRCTS (43%) among the multiparous pregnant females and a lower incidence (12.9%) in the primiparous pregnant females. Thus, this observation stated that enhanced incidence of PRCTS was correlated with higher parity. This correlation was accordant or consistent between PRCTS and parity of pregnant women because of sustained raised hormonal levels during pregnancy. As pregnancy is a state of volume overload, the extra pressure exerted by the volume overload condition on the median nerve passing through a narrow carpal tunnel, results in the functional impairment of the nerve. This scenario becomes significant in affecting the median nerve even more when a female undergoes pregnancy more than once in her reproductive phase of life.^[9] Recruited females in the study population were multiparous as well as primiparous. It was found that out of the total 33 primiparous pregnant females included in cases, 10 were diagnosed as PRCTS positive, which was 30.3% of the total primiparous females. Out of 42 multiparous pregnant females included in cases, 26 were diagnosed as PRCTS positive (61.9%). The Chi-square test was used to see the significant association of a higher parity with the incidence of PRCTS. In this study, out of the 36 diagnosed cases of PRCTS, 10 were primiparous and 26 were multiparous pregnant females. (Chi-square statistic=7.394) ($P = 0.007$). The test revealed a significantly higher incidence of PRCTS among multiparous females.

Since little works has been conducted regarding association of Incidence of PRCTS with parity so we have less literature is available to compare our results. Our study observation stated that enhanced incidence of PRCTS was correlated with the higher parity. This correlation was accordant or consistent between PRCTS and parity of pregnant women because of sustained raised hormonal levels during pregnancy.^[18]

The limitation of the study was less recruitment of pregnant females of different parity. The study could be more informative if different trimesters may be included along with the parity of pregnant females.

CONCLUSION

This cross-sectional study concluded that the prevalence of PRCTS is more pronounced in the multiparous state of parity when compared to primiparous pregnant females. It is of prime value for us to evaluate all the multiparous pregnant females for pregnancy-related CTS through the electrodiagnostic technique so that interventions can be taken to prevent the mononeuropathy accordingly.

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