



Prevalence of Carpel Tunnel Syndrome among Pregnant Women in Lahore City

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Authors' contributions

This work was carried out in collaboration among all authors. Authors ZN and HMA designed the study, authors SN, MF and RR performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors RT and SN managed the analyses of the study. Authors ZN, HMA and SN managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Carpal Tunnel Syndrome (CTS) is one of the most common neuropathies and pregnancy is a risk factor of CTS. The frequency of CTS during pregnancy, especially that according to the gestational age, is not well determined, and here we attempted to determine it in three hospitals in Lahore, Pakistan. By the use of non-probability purposive sampling method, 286 samples of pregnant females were collected. The diagnosis of CTS was made using Phalens test and others. Phalens test was positive in 20.8, 29.6, and 45.3% during 1st, 2nd and 3rd trimester, respectively. The questionnaire data indicated that CTS was present in 11.2, 37.0 and 49.5% in 1st, 2nd and 3rd trimester, respectively. Swelling of the joint was observed in 31.6, 51.9 and 77.8% in 1st, 2nd and 3rd trimester, respectively. The same tendency of the occurrence of CTS according to the three trimesters was observed when using nerve compression test or Tinel's test.

Keywords: Carpal tunnel syndrome; neuropathies; pregnancy; trimester; phalens.

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1. INTRODUCTION

Carpal Tunnel Syndrome (CTS) is one of the collective neuronal disorder that arises due to the compression of the median nerve present under the crosswise retinaculum's [1]. Prolonged firmness of the nerves is due to the reduction in blood drift to giant nerve fiber and it causes removal of myelination [2]. CTS is the major physiological alterations in nerve, with in the Carpal tunnel structure many neighboring constrictions and many other alterations in vascular systems. Few symptoms that causes the CTS i.e. edema [1].

Alterations in senses, capability of suffering individual to receive particular stimuli, specifically vibration threshold and touch are common symptoms of CTS. In early stage of neuropathy vibration threshold alterations happened whereas in older stage of CTS pressure thresholds and other changes have been happened [3]. To recognize the patient having CTS, it is necessary that sensory tools give valuable evidence to update clinicians for the position of patient's sensual retrieval and to create results either to continue with various treatment [4]. According to the United States of America, professional analyses from data in 2010 determined that CTS was spread 6.7% in the population, this is the lifetime occurrence of clinician identified [5,6]. Pregnancy is also a major cause of CTS [7-10] and fresh injury to the upper extremity [11].

Clinically at the time when nerve breakdown happened, symptoms of periodically paresthesia is felt. When neuropathy disease increases, an individual suffering from this disease felt continue paresthesia and feebleness in finger and hands. Later, patient feel potential paralysis and impassiveness in his hands [12]. Nerve injury has five classes; however, the harshness is linked from one to five. Every type of CTS involves in various exhibition of changes to feeling in structural alterations to the middle nerve and physiological changes. The starting cure procedure of non-sever symptoms of CTS commonly consists non-surgical cure, usually having orthotic involvement [13]. The result to continue the surgery is depends upon the concern of patient and established on the clinician's results of measurement. The choice of clinician is to refer a patient to surgery or to finish the cure is depend upon either the alterations in results measurement in survey selection existing a medically essential variations. The measurement of minimal clinically important

differences (MCID) for the signs of sever scale (SSS) in a crowd of individuals having CTS disease later on conservation cure with steroid injection [14].

In a patient, physiological alterations in pregnancy generally outcomes in musculoskeletal pathology. The progression and the history of fundamental neuromuscular disease also alter the immunologic alterations and hormonal changes in a pregnant woman. Beneath few of the pregnant woman suffering changes that are relevant to specific types of neuromuscular illness.

The aim of present study was to check trimester having more risk factors of CTS among pregnant women by keeping a check on pregnant women during all trimester which enable us to make treatment strategies and precautionary measures to avoid CTS problem in Pakistan society.

2. MATERIALS AND METHODS

The present study is descriptive study. Hence, data for study was collected from pregnant women during all three trimesters, patients of three hospitals i.e. lady Aitcheson hospital, lady Willingdon Hospital and National Hospital of Lahore. The sample size was 286 pregnant women. The data was collected by using the non-probability purposive technique of sampling. Samples were screened according to exclusion and inclusion criteria. The data about pregnant women was collected using a validated questionnaire i.e. questionnaire was developed by validating from 10 physiotherapist, specialist in CTS having more than 3 years. To access the CTS, clinically diagnostic test was used. SPSS software (version 22) was used to analyses the data statistically. Qualitative variables were presented in form of percentages and mean tables while quantitative parameters have been shown as mean±SD. Data was displayed by graphs.

2.1 Instruments Used

2.1.1 Tools/scales

Physical examination and patient history of medicines were assessed as a part of CTS assessment. A detailed questionnaire was developed and used to get information from patients including several parameters like weight, gestation period, parity, height, type of work and previous history of treatments [15]. For clinical

manifestations of CTS, other parameters like nerve compression tests having specificity 0.25-0.96 and sensitivity 0.04-0.79, Tinels sign having specificity 0.44-0.95 and sensitivity 0.28 to 0.73 and phalen test having specificity 0.51-0.91 and sensitivity 0.46 to 0.80 were also done for diagnosis of CTS, a scored questionnaire was used.

3. RESULTS

Table 1 reviews the weight, age and height of 248 pregnant females in different clinical situations who contributed in this study. In 1st trimester, mean age of females was about 22.68 ± 4.35 years. In 1st trimester mean weight and height of the females was 67.56 ± 7.69 kg and 1.61 ± 0.60 meters respectively. In 2nd trimester, mean height, age and weight of females was 1.60 ± 0.60 meters, 26.18 ± 4.35 years, and 71.90 ± 7.44 kg respectively. Similarly, in 3rd trimester, mean weight, height and age and of the females was 78.06 ± 7.95 kg, 1.62 ± 0.60 meters and 28.66 ± 4.24 years respectively. To determine frequency of CTS carpal tunnel syndrome, about 286 questionnaires were circulated among the pregnant females in different clinical situations across the Lahore. 248 questionnaires were filled properly from the total 286 questionnaires and returned to researcher. 86% was the response rate of the study.

Chart 1. Place of procedure of the participants

| Place of procedure | Frequency | Percent |
|---------------------|-----------|---------|
| Government hospital | 106 | 42.7 |
| Private clinic | 142 | 57.3 |
| Total | 248 | 100.0 |

248 questionnaires were properly filled and returned to researcher out of 286 pregnant females who contributed in this study. The above given table showed the place of procedure of participants. 57.3% (n=142) were procedure in private clinics while 42.7% (n=106) were procedure in government hospital.

Chart 2. Socioeconomic status of the participants

| Socioeconomic status | Frequency | Percent |
|----------------------|-----------|---------|
| Upper | 45 | 18.2 |
| Middle | 77 | 31.0 |
| Lower | 126 | 50.8 |
| Total | 248 | 100.0 |

248 questionnaires were properly filled and returned to researcher out of 286 pregnant females who contributed in this study. The socioeconomic status of participants after obtaining proper data, upper class ratio was 38.7% (n=96), middle class ratio was 31.0% (n=77) and 30.2% (n=75) belonged to lower class.

Chart 3. Occupation of the participants

| Occupation | Frequency | Percent |
|-------------------|-----------|---------|
| Housewife | 65 | 26.2 |
| Computer operator | 59 | 23.8 |
| Receptionist | 30 | 12.1 |
| Teacher | 64 | 25.8 |
| Any other | 30 | 12.1 |
| Total | 248 | 100.0 |

Chart 3 describes the occupation of the pregnant females who contributed in the study. About 26% females were housewives and teachers while approximately 24% of females were receptionist and computer operator.

Table 1. Descriptive statistics (Age, Height, Weight) in three trimesters

| Trimester | | Descriptive statistics | | | | |
|-----------|--------|------------------------|---------|---------|-------|----------------|
| | | N | Minimum | Maximum | Mean | Std. deviation |
| First | Age | 72 | 21 | 28 | 22.68 | 4.35 |
| | Height | 72 | 1.51 | 1.72 | 1.61 | 0.060 |
| | Weight | 72 | 60 | 85 | 67.56 | 7.69 |
| Second | Age | 81 | 24 | 33 | 26.18 | 4.35 |
| | Height | 81 | 1.50 | 1.71 | 1.60 | 0.064 |
| | Weight | 81 | 60 | 85 | 71.90 | 7.44 |
| Third | Age | 95 | 27 | 36 | 28.66 | 4.24 |
| | Height | 95 | 1.51 | 1.72 | 1.62 | 0.063 |
| | Weight | 95 | 60 | 85 | 78.06 | 7.95 |

Chart 4. Parity status of the participants

| Parity status | Frequency | Percent |
|---------------|-----------|---------|
| Prim gravida | 100 | 40.3 |
| Multi gravida | 148 | 59.7 |
| Total | 248 | 100.0 |

248 questionnaires were properly filled and returned to researcher out of 286 pregnant females who contributed in this study. The parity status of the participants after obtaining proper data, 59.7% (n=148) were multigravida and 40.3% (n=100) were primgravida.

Chart 5 describes the nature of pain at wrist joint in different trimesters of pregnancy. 1st trimester 40.3% females reported pain as sharp in nature. In 2nd trimester majority of female ratio 45.7% informed pain as radiating in nature. In 3rd trimester, about 34.7% females stated pain as either dull or radiating in nature.

248 questionnaires were properly filled and returned to researcher out of 286 pregnant females who contributed in this study. Chart 6 reviews the prevalence of pain at wrist joint in different trimester of pregnant females. 60% of females in 3rd trimester informed pain at wrist joint while 34.6% in second trimester and 27.8% in first trimester respectively.

Chart 7 reviews the complaint of alteration in sensation in different clinical situations of pregnancy. In 3rd trimester, 66.7% females described alteration in sensation at hand. 43.1% in first trimester and 48.1% in second trimester respectively.

Prevalence of swelling at wrist joint in of females was checked. Chart 8 reviews that 77.8% females in 3rd trimester informed swelling at wrist joint while 31.6% in first trimester and 51.9% in second trimester respectively.

Chart 5. Nature of pain

| Nature of pain | Trimester | | |
|----------------|-------------|--------------|-------------|
| | First N (%) | Second N (%) | Third N (%) |
| Radiating | 20 (27.8) | 37 (45.7) | 33 (34.7) |
| Sharp | 29 (40.3) | 22 (27.2) | 29 (30.5) |
| Dull | 23 (31.9) | 22 (27.2) | 33 (34.7) |
| Total | 72 (100) | 81 (100) | 95 (100) |

Chart 6. Pain at wrist joint

| Pain at wrist | Trimester | | |
|---------------|-------------|--------------|-------------|
| | First N (%) | Second N (%) | Third N (%) |
| Yes | 20 (27.8) | 28 (34.6) | 57 (60) |
| No | 52 (72.2) | 53 (65.4) | 38 (40) |
| Total | 72 (100) | 81 (100) | 95 (100) |

Chart 7. Alteration in sensation

| Alteration in sensation | Trimester | | |
|-------------------------|-------------|--------------|-------------|
| | First N (%) | Second N (%) | Third N (%) |
| Yes | 22 (30.6) | 42 (51.9) | 74 (77.8) |
| No | 50 (69.4) | 39 (48.1) | 21 (22.2) |
| Total | 72 (100) | 81 (100) | 95 (100) |

Chart 8. Swelling at hand

| Swelling at hand | Trimester | | |
|------------------|-------------|--------------|-------------|
| | First N (%) | Second N (%) | Third N (%) |
| Yes | 22 (30.6) | 42 (51.9) | 74 (77.8) |
| No | 50 (69.4) | 39 (48.1) | 21 (22.2) |
| Total | 72 (100) | 81 (100) | 95 (100) |

Carpal tunnel syndrome in their family is showed by Chart 9. Significant strong family history was conveyed in females in all the three trimesters of their pregnancy period.

Previous history of carpal tunnel syndrome in different trimester of pregnancy was described in Chart 10. 49.4% 45.8% and 50.5% females in 2nd, 1st, 3rd trimester reported previous history of carpal tunnel syndrome.

The results of Tinel test was positive in all three trimesters of pregnancy period by females who contributed in this study. 20.8% in 1st trimester, 29.6% in 2nd trimester and 45.3% in 3rd trimester reported positive.

Chart 12 reviews the physiotherapy services availed by the pregnant females due to their objections of CTS carpal tunnel syndrome. 20.0% females in first trimester, 53.7% females

in 3rd trimester, 37.0% in second trimester reported availing of physiotherapy services respectively.

Chart 13 summarizes the postural care that was practiced by the females due to the complaints of carpal tunnel syndrome. The 65.3% females in 3rd trimester reported the used of postural care followed by 44.4% and 16.7% in second and first trimester respectively.

The Nerve Compression test was reported positive in all three trimesters. 36.1% in 1st trimester, 51.9% in 2nd trimester and 78.9% in 3rd trimester reported positive.

Phalens test was reported positive in all three trimesters of pregnancy period by the female contributors of this study. 20.8% in 1st trimester, 29.6% in 2nd trimester and 45.3% in 3rd trimester reported positively.

Chart 9. Family history of carpal tunnel syndrome

| Family history of CTS | Trimester | | |
|-----------------------|-------------|--------------|-------------|
| | First N (%) | Second N (%) | Third N (%) |
| Yes | 32 (44.4) | 37 (45.7) | 53 (55.8) |
| No | 40 (55.6) | 44 (54.3) | 42 (44.2) |
| Total | 72 (100) | 81 (100) | 95 (100) |

Chart 10. Previous history of carpal tunnel syndrome

| Previous history of CTS | Trimester | | |
|-------------------------|-------------|--------------|-------------|
| | First N (%) | Second N (%) | Third N (%) |
| Yes | 33 (45.8) | 40 (49.4) | 48 (50.5) |
| No | 39 (54.2) | 41 (50.6) | 47 (49.5) |
| Total | 72 (100) | 81 (100) | 95 (100) |

Chart 11. Tinel test

| Tinel Test | Trimester | | |
|------------|-------------|--------------|-------------|
| | First N (%) | Second N (%) | Third N (%) |
| Positive | 15 (20.8) | 24 (29.6) | 43 (45.3) |
| Negative | 57 (79.1) | 57 (70.4) | 52 (54.7) |
| Total | 72 (100) | 81 (100) | 95 (100) |

Chart 12. Physiotherapy taken

| Physiotherapy | Trimester | | |
|---------------|-------------|--------------|-------------|
| | First N (%) | Second N (%) | Third N (%) |
| Yes | 20 (27.8) | 30 (37) | 51 (53.7) |
| No | 52 (72.2) | 51 (63) | 44 (46.3) |
| Total | 72 (100) | 81 (100) | 95 (100) |

Chart 13. Postural care practiced

| Postural care practiced | Trimester | | |
|-------------------------|-------------|--------------|-------------|
| | First N (%) | Second N (%) | Third N (%) |
| Yes | 12 (16.7) | 36 (44.4) | 57 (65.3) |
| No | 60 (83.3) | 45 (55.5) | 33 (34.7) |
| Total | 72 (100) | 81 (100) | 95 (100) |

Table 2. Nerve compression test

| Nerve compression test | Trimester | | |
|------------------------|-------------|--------------|-------------|
| | First N (%) | Second N (%) | Third N (%) |
| Positive | 26 (36.1) | 42 (51.9) | 75 (78.9) |
| Negative | 46 (63.9) | 39 (48.1) | 20 (21.1) |
| Total | 72 (100) | 81 (100) | 95 (100) |

Chart 14. Phalen's test

| Phalen's Test | Trimester | | |
|---------------|-------------|--------------|-------------|
| | First N (%) | Second N (%) | Third N (%) |
| Positive | 15 (20.8) | 24 (29.6) | 43 (45.3) |
| Negative | 57 (79.1) | 57 (70.4) | 52 (54.7) |
| Total | 72 (100) | 81 (100) | 95 (100) |

Chart 15. Carpal tunnel scoring questionnaire

| CTS scoring | Trimester | | |
|---------------|-------------|--------------|-------------|
| | First N (%) | Second N (%) | Third N (%) |
| Less than 3 | 54 (75) | 19 (23.5) | 19 (20) |
| Between 3 & 4 | 10 (13.8) | 32 (39.5) | 29 (30.5) |
| 5 or more | 8 (11.2) | 30 (37.0) | 47 (49.5) |
| Total | 72 (100) | 81 (100) | 95 (100) |

Each participant also filled the questionnaire called CTS carpal tunnel syndrome scoring. Questionnaire comprised of 9 questions with their replies either in YES or NO. After filling it, score was calculated. A score of 5 or more – likely to be CTS, score 3 or 4 – unclear, score of less than 3 - unlikely to be CTS.

4. DISCUSSION

Carpal tunnel syndrome (CTS) is a type of compression neuropathy it happens when the middle nerve is trampled in a section where it surrounds the wrist. The indication of this disease is burning, emotionlessness and paleness in a median circulation. The judgement of this disease is analyzed from background of patient, physical checkup and electro investigation studies. Electrophysiological examination is a standard use a reference for the recognition of CTS, it's essential to do for every patient having suspicion of this disease. The utmost delicate electro neurodiagnostic

examination is the sensory nerve transmission rate of median nerve. This is concealed in 70%-90% of suspected persons [16,17].

The outcomes of this research are reported the occurrence of CTS significantly greater in 3rd trimester that is 49.5% as compare to 37.0% and 11.2% ladies of 2nd and 1st trimester. Females having 3rd trimester the tests i.e. Tinels, Phalens and Nerve compression test is positive [18]. Pain in wrist joint, change feeling in hands and bulge of the hands are the common symptoms of CTS. Several authors investigated the symptoms of CTS during pregnancy and CTS is the solidity neuropathy that complicates pregnancy, with the occurrence extending from 2% to 35%.

Many factors that are related to CTS are still unidentified. Changes in hormones in pregnant females are major role of this disease. These variations cause the fluid retention and many other changes in the body that basis nerve compression and swelling in the Carpel tunnel.

The retention of fluid is the major reason for which CTS occur during pregnancy. Some authors investigated that weight gain enhance the risk of CTS during pregnancy, but the most common cause is generalized edema causing local swelling. The outcomes of pregnancy are 30 to 50% is rise of extracellular liquid and plasma volume. It's because of the water and renal sodium retention and other is general vasodilation [19]. [20] worked on this questionnaire and has been confirmed by Kamath and Stothard in secondary care for the diagnosis of CTS. About 37.0% of females in 2nd trimester, 49.5% females in 3rd trimester and 11.2% females in 1st trimester scored 5 or more in this questionnaire respectively.

5. CONCLUSION

The results of this study reported of the prevalence of carpal tunnel syndrome considerably higher in 3rd trimester (49.5%) compared to 37.0% and 11.2% females of 2nd and 1st trimester. The commonly used test for the diagnosis of carpal tunnel syndrome included Tinels, Nerve compression test and Phalens test which were also reported positive in higher percentage in females of 3rd trimester. Symptoms that were most commonly reported were swelling of the hands, altered sensation of the hand and pain in wrist joint.

ETHICAL CONSIDERATION AND CONSENT

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

Participant's confidentiality was kept in consideration throughout the study. Consents were issued by the head of department. All patients participated voluntarily.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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