

Risk factors for carpal tunnel syndrome in pregnant women

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ABSTRACT

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Background: Carpal Tunnel Syndrome (CTS) affects 267 people out of every 100,000 in the United States each year, with a prevalence of 9.2% in women and 6% in men. Women are three times as vulnerable as men. Pregnancy can be a risk factor for CTS, which typically occurs in the first and third trimesters and is bilateral. Signs and symptoms will be persistent if CTS develops in early pregnancy and may recur in subsequent pregnancies. Hormonal changes during pregnancy can put you at a greater risk of developing CTS symptoms because the structure of the wrist enlarges and can put pressure on the nerves in the wrist

Objective: This research aims to identify risk factors for the occurrence of CTS in pregnant women. Early detection of risk factors for CTS needs to be done early in pregnancy to be able to make appropriate prevention and treatment efforts for pregnant women who experience CTS.

Methods: This research employed an observational method in conjunction with quantitative analytical research. The population of this research included all pregnant women in the working area of Kedungwuni Health Center I and II in Pekalongan Regency. The sampling technique used was cluster random sampling, with 108 pregnant women meeting the inclusion criteria. Data collection methods entailed interviews and documentation using questionnaires, Phalen's test sheets, and nutritional status measuring tools such as the microtome and bathroom scale. The risk factors to be studied are the relationship between employment status, parity, the incidence of CED, nutritional status before pregnancy, and a history of the disease, with the incidence of CTS. Chi-Square and Odds Ratio was used in bivariate analysis, while multivariate analysis used logistic regression. Significance was set at $p < 0.05$.

Results: The incidence of CTS is significantly related to employment status, nutritional status before pregnancy, CED incidence, parity, and previous medical history (p -value < 0.05).

Conclusion: Starting from the strongest, the strength of the relationship shown by the OR results is employment status (OR 7,231), medical history (OR 6,214), and the incidence of CED (OR 3,428). Occupational status has the highest odds ratio, making it the most important factor in the occurrence of CTS in pregnant women in the Pekalongan Regency.

Latar Belakang: Setiap tahunnya kejadian CTS mencapai 267 dari 100.000 populasi dengan prevalensi 9,2% pada perempuan dan 6% pada laki-laki. Perempuan tiga kali lebih berisiko daripada laki-laki. Pada kondisi hamil dapat menjadi faktor resiko terjadinya CTS, biasanya terjadi pada trimester I dan III dan terjadi secara bilateral. Tanda dan gejala akan persisten apabila CTS berkembang pada awal kehamilan

dan dapat kambuh pada kehamilan berikutnya.

Tujuan: Tujuan dari penelitian ini adalah mengetahui faktor risiko kejadian CTS pada ibu hamil.

Metode: Penelitian ini menggunakan metode observasional dengan jenis penelitian analitik yang menggunakan pendekatan kuantitatif. Populasi dalam penelitian ini adalah seluruh ibu hamil yang berada di Wilayah kerja Puskesmas Kedungwuni I dan II Kabupaten Pekalongan. Teknik pengambilan sampel dilakukan dengan cluster random sampling yang memenuhi kriteria inklusi dan eksklusi sejumlah 108 ibu hamil. Teknik pengumpulan data dengan melakukan wawancara dan dokumentasi dengan menggunakan kuesioner, lembar phalen's test, dan alat ukur status gizi yaitu microtoise dan bathroomscale. Analisa bivariat menggunakan Chi Square dan Odds Ratio, sedangkan Analisa multivariat menggunakan regresi logistik.

Hasil: Status pekerjaan, Status gizi sebelum hamil, kejadian KEK, Paritas, Riwayat penyakit sebelumnya mempunyai hubungan yang bermakna dengan kejadian CTS (p -value < 0,05).

Kesimpulan: Kekuatan hubungan yang ditunjukkan dari hasil OR mulai dari yang terbesar adalah status pekerjaan (OR 7,231), riwayat penyakit (OR 6,214) dan kejadian KEK (OR 3,428). Odds Ratio terbesar adalah status pekerjaan sehingga faktor dominan kejadian CTS pada ibu hamil di Kabupaten Pekalongan adalah status pekerjaan.

INTRODUCTION

According to the National Health Interview Study (NIHS), the prevalence of carpal tunnel syndrome in the adult population is 1.55% (2.6 million). The prevalence of carpal tunnel syndrome (CTS) in the general population is estimated to be 3% in women and 2% in men, with women over 55 having the highest prevalence.¹ The factors thought to be causing the increase in CTS are advanced age, female gender, diabetes, and obesity. Pregnancy, certain occupations, repetitive and cumulative motion injuries, a strong family history, certain medical disorders such as hypothyroidism, autoimmune diseases, rheumatic diseases, arthritis, kidney disease, trauma, anatomical predisposition in the wrist and hand, infectious diseases, and substance abuse are also risk factors.²

Pregnant women require the process of

adapting to physical changes. Most expectant mothers will experience discomfort and anxiety due to the physical changes that occur during pregnancy. During pregnancy, women's anxiety and concerns are generally influenced by various factors such as knowledge, age, education, and employment.³ They are also the primary users of CTS patients. Carpal tunnel syndrome occurs during pregnancy, where fat accumulation and weight gain occur as a consequence of the pregnancy process. As a result, body parts such as the fingers and toes swell due to nerve constriction.⁴

During pregnancy, hormonal changes cause fluid retention, which can narrow the carpal tunnel and compress the median nerve; additionally, the hormone will soften the ligaments that make up the roof of the carpal tunnel, which increases the incidence of CTS. Physiological changes through pregnancy frequently result in musculoskeletal disorders and neuropathy in pregnant women. Fluid retention is the most common cause of CTS during pregnancy. Blood volume increases in pregnant women as a result of increased plasma and erythrocyte volumes.⁵ Carpal tunnel syndrome affects people of all ages and genders, but it is more common in women, particularly during pregnancy.⁶

The findings of a study on 46 pregnant women revealed that 40% of respondents had CTS symptoms after one month, 24% after three months, and 11% after six months. Signs and symptoms will be persistent if CTS develops early in pregnancy and may recur in subsequent pregnancies. This study also showed that the causes of CTS during pregnancy are multifactorial, but the majority of cases of CTS are caused by fluid retention due to hormonal fluctuations. The diagnosis of CTS is based on anamnesis, physical examination, and supporting examinations. Management of CTS during pregnancy is the same as therapy for other CTS, depending on severity. Still, in general, CTS is mild in pregnant women, so symptoms have improved with conservative

therapy. CTS does not heal shortly after delivery, and it can take several weeks for the symptoms to completely disappear.⁷

Previous research claimed that CTS has a prevalence of 23.03%. Ultrasonography (USG) cannot differentiate the signs and symptoms of CTS in pregnancy. The high prevalence of CTS-related signs and symptoms, as well as the difficulties associated with them, emphasize the importance of the diagnosis and treatment required to address the incidence of CTS in pregnancy.⁸ Most women's symptoms will subside after giving birth or breastfeeding, but some may continue to have symptoms for up to three years.⁹

The results of preliminary research conducted in November 2020 in Kedungwuni District, Pekalongan Regency, informed that 80% (8 out of 10) pregnant women have complaints of pain in the wrist area to the fingers. Based on the problem's context, the researchers are interested in researching risk factors for carpal tunnel syndrome in pregnant women in the working area of Kedungwuni Health Center I and II, Kedungwuni District Pekalongan Regency.

METHODS

This research applied observational research methods, in which researchers conducted interviews, observations, and measurements on participants without intervening or treating them. The research method used was analytical research using a quantitative approach. The research aimed to investigate the factors that contribute to the occurrence of CTS in pregnant women. It was a cross-sectional study because the independent variables, including employment status, CED incidence, parity, nutritional status, medical history, and the dependent variable, consisting of CTS incidence in pregnant women, were all studied simultaneously.

The population in this research was all pregnant women in the Kedungwuni Health Center I and II working area of Kedungwuni District, Pekalongan Regency. The cluster

random sampling technique was used to select 108 pregnant women who met the inclusion criteria. Data were collected from December 2020 to April 2021. A questionnaire was used to collect data on the characteristics of respondents in this research, as well as the Phalen's Test sheet, which was used to determine the symptoms of CTS. A nutritional status measuring instrument, such as a microtome was applied to measure height, while a bathroom scale was applied to measure the weight of pregnant women, which later could determine Body Mass Index (BMI) as an assessment of the nutritional status of respondents. A measuring tape was used to measure middle upper arm circumference (MUAC), which was aimed to determine the incidence of CED in pregnant women.

This research received ethical approval from the research ethics committee of the Faculty of Health Sciences, Universitas Muhammadiyah Semarang No: 448/KEPK-FKM/UNIMUS/2020 to research by the principles stated in the International Ethical Guidelines for Human Health Research (CIOMS) WHO 2016. The univariate analysis was used to describe the frequency distribution of employment status, nutritional status before pregnancy, CED incidence, parity, medical history, and incidence of CTS. Meanwhile, bivariate analysis was done using Chi-Square and Odds Ratio; and multivariate analysis was performed with logistic regression.

RESULTS

This research describes the proportion of factors thought to be associated with the incidence of CTS in pregnant women, the magnitude of the risk, and the most dominant risk factors for the incidence of CTS in pregnant women in 2021, including employment status, nutritional status before pregnancy, CED incidence, parity, and medical history. The researchers collected data from 108 pregnant women. Data were collected and analyzed by the researchers. The findings of this research are shown in the table below.

Table 1. Characteristics of Research Subjects

	N (%)	Mean±SD
Age		29,3±3,53
BMI		28,7±3,4
Gestational age		30,4±4,21
Parity:		
Multipara	43 (39,81)	
Primipara	65 (60,19)	
Employment status:		
Employed	38 (35,19)	
Unemployed	70 (64,81)	

Table 2. Prevalence of Risk Factors for CTS in Pregnant Women

Variable	Variable	CTS		Normal		Total	
		n	%	n	%	n	%
Employment status	Employed	30	73,2	8	11,9	38	35,2
	Unemployed	11	26,8	59	88,1	70	64,8
	Total	41	100	67	100	108	100
Nutritional status before pregnancy	Malnutrition	28	68,3	10	14,9	38	35,2
	Normal	13	31,7	57	85,1	70	64,8
	Total	41	100	67	100	108	100
CED incidence	CED (MUAC < 23,5 cm)	34	82,9	9	13,4	43	39,8
	No CED (MUAC < 23,5 cm)	7	17,1	58	86,6	65	60,2
	Total	41	100	67	100	108	100
Parity	Multipara	32	78,0	11	16,4	43	39,8
	Primipara	9	22,0	56	83,6	65	60,2
	Total	41	100	67	100	108	100
Medical history	No illness	26	63,4	10	14,9	36	33,3
	Have certain illness	15	36,6	57	85,1	72	66,7
	Total	41	100	67	100	108	100

Table 3. Bivariate Analysis of Risk Factors for CTS Incidence in Pregnant Women

Variable	P-value	OR	95% CI for EXP (B)	
			Lower	Upper
Employment status	0,000	5,024	2,850	8,856
Nutritional status before pregnancy	0,021	3,968	2,345	6,714
CED incidence	0,007	2,342	1,586	4,031
Parity	0,022	5,375	2,859	10,104
Medical history	0,012	3,467	2,116	5,680

Table 4. Multivariate Analysis of Factors Associated with the Incidence of CTS in Pregnant Woman

Variable	Coef- β	p-value	OR	CI 95%	
Step 1	Employment status	-2,263	0,002	3,855	1,024-8,448
	CED incidence	-2,272	0,001	6,037	1,027-7,389
	Parity	-,973	0,224	5,422	2,079-8,811
	Nutritional status	-,459	0,609	6,846	1,108-3,679
	Medical history	-1,092	0,261	8,267	1,050-2,252
	Constant	3,535	0,000	0,0001	
Step 2	Employment status	-2,313	0,002	4,647	2,023-8,422
	CED incidence	-2,306	0,001	5,320	1,027-9C,374
	Parity	-1,064	0,168	7,231	1,076-1,568
	Medical history	-1,359	0,092	3,986	1,053-1,248
Step 3	Constant	3,502	0,000	0,0001	
	Employment status	-2,699	0,000	7,231	3,017-10,265
	CED incidence	-2,461	0,000	3,428	1,024-8,307
	Medical history	-1,921	0,007	6,214	1,037-6,588
	Constant	3,442	0,000	0,0001	

DISCUSSION

According to the table above, 41 out of a total of 108 respondents had CTS, while the remaining 67 did not. To investigate the relationship between the incidence of CTS in pregnant women and employment status, it was divided into two categories: employed and unemployed. The incidence of CTS was significantly related to employment status (p-value 0.000 (0.05). Pregnant women who worked had a 5.024 times greater chance of developing CTS than pregnant women who did not work (OR 5.024 95% CI 2.850-8.856). Another study highlighted that pregnant women who did not work were the majority of those who experienced CTS (90%).³

Previous studies found a relationship between work duration and CTS incidence; the longer the working period, the higher the incidence of CTS.¹⁰ Other researchers argued that 96.6 % of respondents worked in unusual postures. As a result, the risk of workers experiencing CTS increased. This is especially true for employees who have been doing the job for a long time. Women between the ages of 29-62 are more likely to suffer from CTS.¹¹

Repeated movements with a frequency of

≥ 30 times in one minute performed every day can increase tendinitis which causes nerve compression and causes CTS. Therefore, workers are expected to work to their abilities and rest (stretch their hands) sufficiently if the length of work exceeds 4-8 hours to facilitate blood flow and there is no emphasis on the median nerve.¹¹

The incidence of CED was categorized into CED (MUAC < 23.5 cm) and non-CED (MUAC \geq 23.5 cm). The incidence of CED had a significant relationship with the CTS in pregnant women with a p-value of 0.007 (<0.05). Pregnant women who experienced CED had a 2.342 times more chance of experiencing CTS than pregnant women who did not experience CED (OR 2.342 95% CI 1.586-4.031). CTS was not confirmed in pregnant women with lean body weight or even those in the CED category, because CTS is at risk of increasing BMI, which can be caused by an increase in fat tissue in the carpal tunnel, increasing hydrostatic pressure along the carpal tunnel in obese people.¹²

Parity was classified into multipara (pregnancy > 1) and primipara (first pregnancy). Parity had a significant relationship with CTS incidence in pregnant women with a p-value

of 0.022 (<0.05). Compared to primiparas, multiparous pregnant women had a 5.375 times greater chance of experiencing CTS (OR 5.375 95% CI 2.859-10.104). This is consistent with other studies that showed multigravida mothers had the highest rate of CTS.³ CTS has a good prognosis, and symptoms usually disappear after the delivery. This varies from person to person. 95% of pregnant women's symptoms will simply diminish two weeks after giving birth and can still be felt one month later. Pregnant women should be educated about activities that may aggravate symptoms or lengthen the healing period of CTS after delivery, and they should be reassured that symptoms will disappear soon after delivery. To shorten the recovery period, avoid factors that can worsen symptoms.

Nutritional status before pregnancy was categorized into malnourished (BMI < 18.5 or ≥ 23) and normal (BMI 18.5-22.9). Nutritional status had a significant relationship with CTS incidence in pregnant women with a p-value of 0.021 (<0.05). Compared to normal nutritional status, women with malnutrition had a 3,968 times greater chance of experiencing CTS (OR 3,968 95% CI 2,345-6,174). According to the previous study's findings, the most common risk factors for CTS were multigravida pregnant women with a bodyweight > 61 kg and gestational age in the third trimester.¹³ According to Kouyoumdjian's research, CTS is caused by compression of the median nerve under the transverse carpal ligament and is associated with increased body weight and BMI. A low body mass index (BMI) is a favorable health condition for protecting median nerve function. The American Obesity Association found that 70% of people with CTS are overweight. The risk of CTS increases for every 8% increase in BMI.¹ One of the risk factors in people with an obese body is the increased fat content of the carpal tunnel, which causes the hydrostatic pressure to rise. When people with a high BMI recline, the increased blood volume shifts to the upper extremities, causing venous congestion in the carpal tunnel's synovial flexor sheets and increased intracranial pressure.

Medical history was divided into two categories: no illness history and illness history. Medical history had a significant relationship with CTS incidence in pregnant women with a p-value of 0.012 (<0.05). Pregnant women who had a history of illness (rheumatism/hand fractures/diabetes mellitus) had 3,467 times increased risk of CTS compared to pregnant women without illness history (OR 3,467 95% CI 2,116-5,680). Previous research suggested that someone with a disease that causes CTS, such as diabetes, rheumatoid arthritis, trauma, fracture, obesity, or pregnancy, did not always experience CTS.³ The risk factors for CTS include genetics, certain diseases (diabetes mellitus, hypothyroidism, and rheumatoid arthritis), obesity, activities that require repetitive wrist flexion movements and work with vibrating tools such as a grinder.¹⁴

The p-value for nutritional status was the highest in step 1 of Table 3. As a result, nutritional status should be excluded from step 1. Step 2 indicated that the parity had the highest p-value, so it must be excluded. The third step of table 3 was the result of logistic regression, which shows the factors of employment status, CED incidence, and medical history. Starting from the strongest, the strength of the relationship shown by the OR results is employment status (OR 7,231), medical history (OR 6,214), and the incidence of CED (OR 3,428). Because employment status has the highest odds ratio, it is the most important factor in the occurrence of CTS in pregnant women in the Pekalongan Regency.

Work that requires a large number of limbs, particularly the hands and wrists, for an extended period allows CTS to develop. Furthermore, the amount of time spent doing work activities that require repetitive hand movements is also a risk factor. A person who has worked long hours does not necessarily have to work for a long time, because a worker can take a lot of rest during the time between works. Muscles contract or wrinkle while working, and relax or stretch when at rest.¹⁵ This is supported by studies that show that repetition and combined exposure to both strength and repetition can increase the

risk of developing Carpal Tunnel Syndrome.¹⁶ Efforts that can be applied to pregnant women to increase functionality and reduce the severity of CTS disease are to perform nerve and tendon slip exercises for patients with mild carpal tunnel syndrome symptoms until a simple method is found.¹⁷

CONCLUSION

Factors associated with the occurrence of carpal tunnel syndrome in pregnant women include employment, nutritional status before pregnancy, the occurrence of CED, parity, and medical history. Starting from the strongest, the strength of the relationship shown by the OR results is employment status (OR 7,231), medical history (OR 6,214), and the incidence of CED (OR 3,428). Employment status has the highest odds ratio, making it the most critical factor in the occurrence of CTS in pregnant women in the Pekalongan Regency.

Suggestions for the government that can be submitted through village midwives and health cadres include providing family assistance to overcome the incidence of CTS in pregnant women, revitalizing the class for pregnant women to increase community participation, and health cadres monitoring the incidence of CTS in pregnant women. It is also recommended that village midwives and health cadres provide more CTS prevention counseling to pregnant women.

CONFLICT OF INTEREST

The researchers declare that there is no conflict of interest in carrying out the research.

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