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Carpal Tunnel Syndrome Incidence in Teachers and Employees at SMP Negeri 1 Pematangsiantar

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ABSTRACT

Introduction: Median nerve compression at the wrist (carpal tunnel syndrome) is the most common disorder affecting the median nerve and is the most common nerve compression syndrome. Problems usually arise from excessive hand use and work microtrauma.

Objectives: To determine the incidence, severity, characteristics of respondents detected, and risk factors that allow for carpal tunnel syndrome (CTS).

Methods: The study was an analytic-descriptive study with a cross-sectional approach. Using 70 samples of data from educators and employees at SMP Negeri 1 Pematangsiantar. Data were analyzed using univariate and bivariate analysis.

Results: This study involved 70 educators and employees, 59 (84.3%) were found with the majority of respondents experiencing complaints with asymptomatic symptom severity 46 people (65.7%), mild 22 people (31.4%), and moderate 2 people (2.9%). Of the 59 respondents detected, 50 people (71.4%) had mild functional symptom status. The majority of respondents detected with CTS were female (74.6%) and were in the age range of 51-60 years (44%). Respondents detected with CTS had nutritional status type I obesity (34%). Of the 59 respondents detected with CTS, 54 people (91.5%) were educators who had a working duration of ≥8 hours a day (52.5%) and experienced complaints in the left hand (69.5%).

Conclusion: Most predominantly female in the age range of 51-60 years who worked as educators with a working duration of ≥8 hours and the majority experienced complaints in the left hand.

Keywords: Carpal tunnel syndrome, educators, incidence

1. Introduction

Median nerve compression at the wrist (carpal tunnel syndrome) is the most common disorder affecting the median nerve and is the most common nerve compression syndrome. It

usually occurs as a result of overuse of the hand and is associated with work-related microtrauma [1]. The National Health Interview Study (NHIS) stated from their research they estimated the prevalence of CTS to be 1.55% or 2.6 million data in the general population. The incidence of Carpal Tunnel Syndrome has been predicted to occur as much as 3.8% of the general population with an incidence rate of 276 cases per 100,000 people yearly and is more often found in women than in men. Carpal tunnel syndrome is often found bilaterally in the age range of 40- 60 years, the youngest age range is 20 years old and the oldest age range is 87 years old [2]. Based on the incidence and disability rates, Carpal Tunnel Syndrome is a work-related disease. Studies in America and Italy reported the incidence of Carpal Tunnel Syndrome at 2.3 per 100 people yearly and 5.4 per 100 people yearly [3].

Carpal Tunnel Syndrome occurs due to entrapment of the median nerve beneath the flexor retinaculum, causing weakness, paresthesias, and pain in the wrist and hand, thus reducing quality of life. The severity of the disorder and the effectiveness of therapeutic interventions are usually determined by a physical examination involving assessment of function performance and pain, evaluation of sensation and strength, and also by electrodiagnostic testing [4]. Patient with Carpal Tunnel Syndrome often report numbness, tingling, and pain in the thumb, second finger, third finger, and radial side of the fourth finger, which tends to be worse at night. The distribution of these symptoms can vary, ranging from discomfort localized to the wrist, encompassing the entire hand, radiating down the forearm, or extending upward past the elbow to the shoulder. Management of carpal tunnel syndrome can be divided into conservative management and operative management. Conservative therapy consists of exercise therapy, using of the ergonomic tools, physiotherapy, medication or use of the certain drugs, immobilization therapy, and acupuncture. Operative therapy can be performed with several indications, conservative therapy fails, there is atrophy of thenar muscles, and significant decrease in sensory function [5].

2. Methods

The study used a descriptive analytic cross-sectional research methodology. This research design was chosen because the purpose of the study was to determine the incidence of Carpal Tunnel Syndrome in a community in a particular examination. Each subject in this research design was observed only once and the measurement of subject variables was carried out during the examination. The population in the study was all educators and employees working at SMP Negeri 1 Pematangsiantar, consisting of 17 male teachers, 49 female teachers, 5 male employees, and 5 female employees. The sample in this study were individuals who met the inclusion criteria and exclusion criteria are the basis for selecting research samples in accordance with the objectives of the study. The inclusion criteria of the subjects are all educators and employees registered and working at SMP Negeri 1 Pematangsiantar and willing to be research samples by filling out an informed consent. The exclusion criteria were subjects who have experienced injury (open fracture) in the wrist, subjects with deformities (nerve dysfunction and congenital defects) in the shoulder, arm, or hand, and subjects who were taking the anti-tuberculosis drug Isoniazid or undergoing chemotherapy procedures.

The method of data collection in this study was an interview with respondents. The researcher will ask several questions to respondents containing an assessment of the severity of Carpal Tunnel Syndrome and an assessment of the respondent functional scale. The tools used to collect data were the Boston Carpal Tunnel Syndrome Questionnaire (BCTQ) and the research subject identity data questionnaire.

3. Result and Discussion

This research consists of 70 respondent samples, with a breakdown of 19 male teachers, 46 female teachers, 2 male staff members, and 3 female staff members, each possessing various characteristics as shown in Table 1.

The majority of respondents were female as many as 49 people (70%), in the age range of 51-60 years as many as 30 people (42.9%), with nutritional status of grade I obesity as many as 24 people (34.3%), working as educators as many as 65 people (92.9%) with a working duration of ≥8 hours (54.3%) and experiencing complaints on the left hand as many as 41 people (58.6%).

Table 1. Demographic Characteristics of Research Subjects

Characteristics		Frequency	Percentage (%)
Sex	Male	21	30
	Female	49	70
Age	21-30 years	10	14,3
	31-40 years	10	14,3
	41-50 years	20	28,6
	51-60 years	30	42,9
Nutritional Status	Underweight	1	1,4
	Normal	15	21,4
	Overweight	17	24,3
	Obesity grade I	24	34,3
	Obesity grade II	13	18,6
Occupation	Educators	65	92,9
	Employees	5	7,1
Work Duration	< 8 hours	32	45,7
	≥8 hours	38	54,3
Location	Right	10	14,3
	Left	41	58,6
	Bilateral	8	11,4
	No complaints	11	15,7

In Table 2, it was found that the respondents detected to have STK were 59 people, or 84.3%, and those not detected were 11 people, or 15.7%.

Table 2. The Incidence of Carpal Tunnel Syndrome, Severity of Symptoms, and Functional Status

	n	%
Yes	59	84,3
No	11	15,7
Total	**70**	**100**
Degree of Severity	**n**	%
Asymptomatic	46	65,7
Mild	22	31,4
Moderate	2	2,9
Severe	0	0
Total	**70**	**100**
Functional Status	**n**	%
Asymptomatic	11	15,7
Mild	50	71,4
Moderate	7	10
Severe	2	2,9
Total	**70**	**100**

Based on the individual characteristics of 59 respondents who experienced CTS at SMP Negeri 1 Pematangsiantar, the highest occurrence was among female respondents, totaling 44 people or 74.6%, with the age group of 51-60 comprising 26 people or 44%, and with obesity type I status being present in 20 people or 34%. The occurrence of carpal tunnel syndrome in women is more frequent than in men. This is due to several factors, such as the relative cross-sectional areas (RCSAs) being smaller in women compared to men, with a range of values in men being 7.3-15.6 mm and in women 5.8-12.1 mm [6]. The decrease in estrogen levels in women who have experienced menopause also plays a role in increasing the risk of carpal tunnel syndrome in women [7].

The majority of respondents experiencing carpal tunnel syndrome complaints are in the age range of 51- 60 years. This is caused by the onset of bone degeneration at the age of 30. This condition will lead to decreased stability of tissues, bones, and muscles, followed by tissue damage, tissue reduction, and replacement with scar tissue, which can increase the risk of CTS [8]. The relationship between nutritional status (BMI) and the risk of stroke still cannot be fully explained at this time. However, some studies suggest that obese patients gradually accumulate excess adipose tissue within the carpal tunnel, narrowing the tunnel and resulting in higher intracarpal canal pressure, which leads to stroke occurrence [9].

Table 3. Frequency distribution of respondents detected with Carpal Tunnel Syndrome

Characteristics		Frequency	Percentage (%)
Sex	Male	15	25,4
	Female	44	74,6
Age	21-30 years	7	11,9
	31-40 years	9	15,3
	41-50 years	17	28,8
	51-60 years	26	44,0
Nutritional Status	Underweight	1	1,7
	Normal	10	16,9
	Overweight	15	25,4
	Obesity grade I	20	34,0
	Obesity grade II	13	22,0
Occupation	Educators	65	91,5
	Employees	5	8,5
Work Duration	< 8 hours	32	47,5
	≥8 hours	38	52,5
Location	Right	10	16,9
	Left	41	69,5
	Bilateral	8	13,6

Based on the job characteristics of 59 respondents who experienced CTS at SMP Negeri 1 Pematangsiantar, the most common occurrence was among educational staff, with 54 individuals or 91.5% working for ≥8 hours. Regarding the severity of symptoms and functional status among respondents who experienced CTS at SMP Negeri 1 Pematangsiantar, the majority had asymptomatic symptoms (46 individuals or 65.7%) and mild functional status (50 individuals or 71.4%). In terms of the location of complaints, the left hand was the most affected, with 41 individuals or 69.5%. In the general workforce population, school teachers have a high prevalence of musculoskeletal disorders, ranging from 40-95%. This is related to the duties of teachers, which

not only involve teaching students but also include preparing teaching materials, assessing student assignments, and participating in extracurricular activities [10]. Jobs that require specific gripping positions and strength for prolonged periods can trigger inflammation processes that impact the narrowing of the carpal tunnel and increase the risk of pressure on the median nerve within the carpal tunnel [11].

Workers who worked ≥8 hours per day had a 10.28 times higher chance of reporting CTS symptoms. This can be caused by work using hand movements during a longer working period making the movement done repeatedly around the wrist area. This triggers the inflammatory process which has an impact on narrowing and compression of the median nerve in the carpal tunnel [12]. Respondents with complaints of non-dominant hands mostly carried out daily activities with both hands or called ambidextrous and experienced the same initial complaints in both hands. In an effort to protect the dominant hand, the respondent used a non-dominant hand so that the complaints experienced became more intense in the non-dominant hand [13].

In this study, the majority of respondents who experienced CTS had a female gender (89.8%) compared to a male gender (71.4%). The results of the calculation obtained a p-value (0.075) and a prevalence ratio (PR) of 0.991 which showed that it was statistically meaningless, but female respondents had a 0.991 times higher risk of developing CTS compared to male respondents (95% CI 0.076-1.067).

In this study, it was found that the majority of respondents experienced CTS at the age of ≥30 years (86.7%) compared to the age of <30 years (70%). The results of the calculation obtained a p-value (0.186) and a prevalence ratio (PR) of 1.604 showed that it was statistically meaningless, but respondents at the age of ≥30 years had a 1.604 times higher risk of developing CTS compared to respondents aged <30 years (95% CI 0.077- 1.681).

Table 4. Bivariate Analysis of the Incidence of Respondents Detected with Carpal Tunnel Syndrome

	Carpal Tunnel Syndrome						PR (95%CI)	*p-Value*
	Yes		No		Total			
	n	%	n	%	n	%		
Sex							0,991	
Male	15	71,4	6	28,6	21	100	(0,076-	0,075
Female	44	89,8	5	10,2	49	100	1,067	
Age							1,604	
< 30 years	7	70	3	30	10	100	(0,077-	0,186
≥ 30 years	52	86,7	8	13,3	60	100	1,681)	
Nutritional Status							0,996	
≤ 22,9 kg/ m^2	11	68,8	5	31,3	16	100	(0,071-	0,110
>22,9 kg/ m^2	48	88,9	6	11,1	54	100	1,067)	
Occupation							0,183	
Educators	54	83,1	11	16,9	65	100	(0,744-	1,000
Employees	5	100	0	0	5	100	0,927)	
Work Duration							5,562	
< 8 jam	28	87,5	4	12,5	32	100	(0,418-	0,533
≥ 8 jam	31	81,6	7	18,4	38	100	5,980)	

The majority of respondents who experienced carpal tunnel syndrome in this study had an above-normal nutritional status (>22.9 kg/m2), which was 88.9% compared to normal and below normal nutritional status (≤ 22.9 kg/m2) as much as 68.8%. The results of the calculation of p-value (0.110) and prevalence ratio (PR) of 0.996 showed that statistically it was not meaningful, but respondents with nutritional status above normal had a 0.996 times higher risk of experiencing CTS compared to respondents with nutritional status below normal (95% CI 0.071-1.067).

The majority of respondents who experienced carpal tunnel syndrome in this study worked as educators (83.1%) compared to those who worked as employees. The results of the calculation of p-value (1,000) and prevalence ratio (PR) of 0.813 showed that statistically it was not meaningful, but respondents with nutritional status above normal had a 0.183 times higher risk of experiencing CTS compared to respondents who worked as employees (95% CI 0.744-0.927). In this study, it was found that the majority of respondents experienced CTS had a work duration of ≥ 8 hours compared to respondents who had a working duration of <8 hours. The results of the calculation of p-value (0.533) and prevalence ratio (PR) showed that it was statistically meaningless, but respondents who had a working duration of ≥ 8 hours had a 5.562 times higher risk of experiencing CTS compared to respondents who had a working duration of <8 hours (95% CI 0.418-5.980).

4. Conclusion

The frequency of CTS incidence in educators and employees at SMP Negeri 1 Pematangsiantar was 59 people (84.3%) out of 70 educators and employees who were sampled. Based on the individual characteristics of 59 respondents who experienced CTS at SMP Negeri 1 Pematangsiantar, the most common occurred in female respondents, with the age group of 51-60 years, with the nutritional status of type I obesity. Based on the job characteristics of 59 respondents who experienced CTS at SMP Negeri 1 Pematangsiantar, the most occurred in the type of work of educators with a working duration of ≥8 hours. Based on the severity of symptoms and functional status in respondents who experienced CTS at SMP Negeri 1 Pematangsiantar, the most asymptomatic symptoms experienced the severity of asymptomatic symptoms and mild functional status.

5. Acknowledgements

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6. Conflict of Interest

We declare that there is no conflict of interest in the implementation of this research.

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