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THE RELATIONSHIP OF AGE, *BODY MASS INDEX (BMI)*, AND FREQUENCY OF REPETITIVE MOVEMENTS WITH THE INCIDENT OF *CARPAL TUNNEL SYNDROME (CTS)* IN WOMEN WITH THE HABIT OF WASHING CLOTHES BY HAND IN MUARA UNTU VILLAGE, MURUNG RAYA DISTRICT, CENTRAL KALIMANTAN PROVINCE

Noor Reza Indah Lestari[1], Sintha Nugrahini[2], Dian Mutiasari[3], Abi Bakring Balyas[4], Nisa Kartika Komara[5]
[1]Medical Education Study Program, Faculty of Medicine, Palangka Raya University, Palangka Raya
[2]Department of Anatomy and Histology, Faculty of Medicine, Palangka Raya University, Palangka Raya
[3]Department of Community Health Sciences, Faculty of Medicine, Palangka Raya University, Palangka Raya
[4,5]Department of Physiology, Faculty of Medicine, Palangka Raya University, Palangka Raya
e-mail: nrrezaindah13@gmail.com

ABSTRAK

Sebagian besar wanita di Desa Muara Untu masih mencuci pakaian menggunakan tangan hampir setiap hari. Kecepatan tangan, posisi tangan yang ekstrim, gerakan berulang dengan tekanan dalam waktu yang lama dan genggaman pada saat mengucek pakaian yang menggunakan kekuatan adalah salah satu faktor resiko terjadinya *Carpal Tunnel Syndrome.* Penelitian ini bertujuan untuk mengetahui hubungan usia, *Body Mass Index*, dan frekuensi gerakan repetitif dengan kejadian *Carpal Tunnel Syndrome* pada wanita yang mencuci pakaian menggunakan tangan di Desa Muara Untu Kabupaten Murung Raya Provinsi Kalimantan Tengah. Penelitian ini merupakan studi korelasi yang menggunakan desain Cross Sectional. Instrumen dalam penelitian ini adalah kuesioner *Boston-Carpal Tunnel Questionare (BCTQ)* dan kuesioner pemeriksaan fisik *Phalen's test.* Berdasarkan analisis bivariat ditemukan bahwa hubungan usia dengan *Carpal Tunnel Syndrom* menghasilkan koefisien korelasi 0,318 dengan probabilitas 0,001, hubungan *Body Mass Index* dengan kejadian *Carpal Tunnel Syndrome* menghasilkan koefisien korelasi 0,111 dengan probabilitas 0,210, dan hubungan frekuensi gerakan repetitif dengan kejadian *Carpal Tunnel Syndrome* menghasilkan koefisien korelasi 0,077 dengan probabilitas 0,385. Kesimpulannya adalah terdapat hubungan yang signifikan antara usia dengan kejadian *Carpal Tunnel Syndrome* dan tidak terdapat hubungan yang signifikan antara *Body Mass Index* dan frekuensi gerakan repetitif dengan kejadian *Carpal Tunnel Syndrome.*

Kata kunci : Carpal Tunnel Syndrome., Usia., Body Mass Index., Gerakan Repetitif.

ABSTRACT

Most women in Muara Untu Village still wash clothes by hand almost every day. Hand speed, extreme hand positions, repetitive movements with pressure for a long time and grip when rubbing clothes using force are one of the risk factors for *Carpal Tunnel Syndrome*. This study aims to determine the relationship between age, *Body Mass Index*, and frequency of repetitive movements with the incidence of *Carpal Tunnel Syndrome* in women who wash clothes by hand in Muara Untu Village, Murung Raya Regency, Central Kalimantan Province. This research is a correlation study using a cross sectional design. The instruments in this study were the *Boston-Carpal Tunnel Questionnaire (BCTQ)* and the *Phalen's test* physical examination questionnaire. Based on bivariate analysis, it was found that the relationship between age and *Carpal Tunnel Syndrome* produced a correlation coefficient of 0.318 with a probability of 0.001, the relationship between *Body Mass Index* and the incidence of *Carpal Tunnel Syndrome* produced a correlation coefficient of 0.111 with a probability of 0.210, and the relationship between the frequency of repetitive movements and the incidence of *Carpal Tunnel Syndrome* produced a correlation coefficient of 0.077 with a probability of 0.385. The conclusion is that there is a significant relationship between age and the incidence of *Carpal Tunnel Syndrome* and there is an insignificant relationship between *Body Mass Index* and frequency of repetitive movements and the incidence of *Carpal Tunnel Syndrome*.

Keywords : *Carpal Tunnel Syndrome.*, Age, *Body Mass Index.*, Repetitive Movements.

INTRODUCTION

Indonesia is a maritime country and the largest archipelagic country in the world, so of course activities carried out at sea and in rivers have become part of people's daily lives. If we explore further, many villages in Indonesia are built along rivers. Kalimantan Island itself has 63 rivers covering 73% of the total island. The longest rivers in Indonesia are also found on Kalimantan Island, namely the Kapuas River, Mahakam River and Barito River. Muara Untu Village is a village located in Murung District, Murung Raya Regency, Central Kalimantan Province. Muara Untu Village is one of the villages built along the river, namely the Barito River. Most women in this village still wash clothes by hand almost every day, both morning and evening. Hand speed, extreme hand positions, repetitive movements with pressure for a long time and grip when rubbing clothes using force are one of the risk factors for *Carpal Tunnel Syndrome*. *Carpal Tunnel Syndrome* is a condition where pressure occurs when the *median nerve* passes through the *carpal tunnel* in the wrist. Pressure on the *median nerve* causes motor and sensory disorders in the hand and finger area. Motor disorders that can occur include weakening of the muscles at the base of the thumb, resulting in loss of grip strength and hand skills. Sensory disorders that occur include tingling and decreased touch sensitivity on the sides of fingers I, II, III and IV. *Carpal Tunnel Syndrome* can occur in all circles, both among the general public and among workers. According to the *National Health Interview Study (NHIS)*, the prevalence of *Carpal Tunnel Syndrome* is 1.55%, this is what makes it one of the three most common groups of *Cumulative Trauma Disorder (CTD)* in the upper limbs. According to the *International Labor Organization (ILO)*, it shows that in every case of occupational disease, *Carpal Tunnel Syndrome* is almost always found in several countries. In 2010 the number of cases of *Carpal Tunnel Syndrome* due to work increased by around 30% compared to 2001. The prevalence of *Carpal Tunnel Syndrome* due to work in Indonesia is still unknown because not much research has been conducted on this topic in Indonesia. However, studies showing high risk wrist and hand occupations report a prevalence of *Carpal Tunnel Syndrome* ranging from 5.6% to 15%.

Carpal Tunnel Syndrome occurs more often in women than men with an age range of 25-64 years. The highest age for this syndrome to occur is >55 years, with the most susceptible age being 40-60 years. Women who do not have symptoms of *Carpal Tunnel Syndrome* at a vulnerable age are less likely to have symptoms of this syndrome at an older age. The prevalence of this syndrome among the general population is 5% of women and 0.6% of men. A study shows *that Carpal Tunnel Syndrome* is closely related to a person's *Body Mass Index*, which is said to mean that *Carpal Tunnel Syndrome*, which is caused by compression of the *median nerve* under the *transverse carpal ligament*, is related to an increase in a person's weight. This research also shows that someone with an abnormal *Body Mass Index* is at greater risk of experiencing symptoms of *Carpal Tunnel Syndrome* than someone with a normal *Body Mass Index* with a ratio of 5:1. Repetitive movement frequency is a risk factor for *Carpal Tunnel Syndrome*. Repetitive movements or repeated movements carried out for a long period of time without rest can cause fatigue and tension in the muscle tendons, this reduces blood flow in the peripheral blood vessels and reduces the function of the blood vessels in the wrist, causing symptoms of *Carpal Tunnel Syndrome*.

This study aims to determine the relationship between age, *Body Mass Index*, and frequency of repetitive movements with the incidence of *Carpal Tunnel Syndrome* in women who wash clothes by hand in Muara Untu Village, Murung Raya Regency, Central Kalimantan Province.

MATERIALS AND METHODS

The research was conducted in Muara Untu Village, Murung Raya Regency, Central Kalimantan Province in June-July 2023 using an observational method with a quantitative approach and a *Cross Sectional* design, namely looking at the relationship between age, *Body Mass Index*, and frequency of repetitive movements with the incidence of *Carpal Tunnel Syndrome*. The population of this study were all women with the habit of washing clothes by hand in Muara Untu Village, Murung Raya Regency, Central Kalimantan. The sample for this study was all women with the habit of washing clothes by hand who had symptoms of *Carpal Tunnel Syndrome* during the *Phalen's test* in Muara Untu Village, Murung Raya Regency, Central Kalimantan. The sample was taken using the *Purposive Sampling Technique* and calculated using the *Slovin* formula which makes the total sample in the study This numbered 130 people. The independent variables in this study were age, *Body Mass Index*, and frequency of repetitive movements. Meanwhile, the dependent variable is *Carpal Tunnel Syndrome*.

The materials and tools in this research are *Body Mass Index* measuring instruments (*microtoise*, *bathroom scale*, and calculator), and a stopwatch. Meanwhile, the research instruments used in this study were questionnaires (respondent characteristics questionnaire and the *Boston-Carpal Tunnel Questionnaire (BCTQ))*, and the *Phalen's test* physical examination questionnaire.

Respondents will be asked to sign *Informed Consent* after listening to the explanation, then respondents will carry out a physical examination of the *Phalen's test* for a maximum of 1 minute. Respondents who had symptoms of *Carpal Tunnel Syndrome* then filled out a respondent characteristics questionnaire, took *Body Mass Index* measurements, filled out the *Boston-Carpal Tunnel Questionnaire (BCTQ)*, and finally measured the frequency of repetitive movements. Data analysis was carried out using a computer and the SPSS for Windows version 26 application, after which the researcher carried out hypothesis testing and independence testing using the *Spearman Rank* test.

This research was approved by the Research Ethics Committee of the Faculty of Medicine, Palangka Raya University No. 77/UN24.9/LL/2023

RESULTS

Table 1 Analisis Deskriptif Variabel Usia

Age	Frequency	Percentage
Late teens	21	16,2%
Early adulthood	23	17,7%
Late adulthood	45	34,6%
Early seniors	24	18,5%
Late seniors	17	13,1%
Total	**130**	**100,0%**

Table 1 is a descriptive analysis of the age variable based on filling out the respondent characteristics questionnaire for the age variable. Based on the results from table 1, it can be said that the majority of women with the habit of washing clothes by hand in Muara Untu Village, Murung Raya Regency, Central Kalimantan who were involved in this research were of late adulthood.

Table 2 Descriptive Analysis of *Body Mass Index* Variables

BMI	Frequency	Percentage
Heavy skinny	4	3,1%
Light skinny	5	3,8%
Normal	54	41,5%
Light grease	18	13,8%
Heavy fat	49	37,7%
Total	**130**	**100,0%**

Table 2 analysis is a descriptive of the *Body Mass Index* variable based on filling out the questionnaire on the characteristics of *Body Mass Index* respondents. Based on table 2, it can be said that the majority of women with the habit of washing clothes by hand in Muara Untu Village, Murung Raya Regency, Central Kalimantan who were involved in this research had a *Body Mass Index* in the normal category.

Table 3 Descriptive Analysis of Frequency of Repetitive Movements

Movement Frequency Repetitive	Frequency	Percentage
30 – 60 times/minute	2	1,5%
61 – 100 times/minute	37	28,5%
101 – 130 times/minute	58	44,6%
> 131 times/minute	33	25,4%
Total	**130**	**100,0%**

Table 3 is a descriptive analysis of the variable frequency of repetitive movements based on filling out the questionnaire on the characteristics of respondents for the variable frequency of repetitive movements. Based on table 3, it can be said that the majority of women with the habit of washing clothes using their hands in Muara Untu Village, Murung Raya Regency, Central Kalimantan who were involved in this research carried out repetitive movement frequencies of 101 – 130 times/minute.

Table 4 Descriptive Analysis of *Carpal Tunnel Syndrome*

CTS	Frequency	Percentage
Normal	5	3,8%
Light	58	44,6%
Currently	45	34,6%
Heavy	14	10,8%
Very Heavy	8	6,2%
Total	**130**	**100,0%**

Table 4 is a descriptive analysis of the variable incidence of *Carpal Tunnel Syndrome* based on filling in the *Boston Carpal Tunnel Questionnaire (BCTQ)*. Based on table 4, it can be said that most women with the habit of washing clothes by hand in Muara Untu Village, Murung Raya Regency, Central Kalimantan who were involved in this research experienced symptoms of *Carpal Tunnel Syndrome* in the light category.

Table 5 Analysis of the Relationship between Age, *Body Mass Index*, and Frequency of Repetitive Movements and the Incidence of *Carpal Tunnel Syndrome*

Variable Relationships	*ρ*	Correlation Coefficient
Age with *CTS*	0,001	0,318
BMI with *CTS*	0,210	0,111
FGR with *CTS*	0,385	0,077

Table 5 is an analysis of the relationship between age, *Body Mass Index*, and frequency of repetitive movements and the incidence of *Carpal Tunnel Syndrome*. Based on probability <alpha (5%), it can be stated that there is a significant relationship between age and the incidence of *Carpal Tunnel Syndrome* with a weak level of closeness and there is no significant relationship between *Body Mass Index* and frequency of repetitive movements and the incidence of *Carpal Tunnel Syndrome* with a level of very weak relationship

1. DISCUSSION

This study shows that there is a significant relationship between age and the incidence of *Carpal Tunnel Syndrome* with a weak level of relationship. This means that increasing age is followed by an increase in *Carpal Tunnel Syndrome*, conversely, decreasing age is followed by a decrease in *Carpal Tunnel*

Syndrome. This is because starting from the age of 30 years, degeneration occurs such as tissue damage, tissue changes to scar tissue, fluid loss, bones and muscles become less stable, thereby increasing the risk factors for *Carpal Tunnel Syndrome*. Research by Richard says that the older a person is, the higher the risk of experiencing *Carpal Tunnel Syndrome*. The average age for this syndrome to occur is 25-64 years, with the most susceptible age being 40-60 years. This is because age directly affects a person's physical capacity starting from the age of 25 years, which is proven by the age of 50 to 60 years, muscle strength decreases by 25% and sensory and motor abilities decrease by 60%. Research by Dede et al. and Moutasem said that *Carpal Tunnel Syndrome* can also occur because starting from the age of 30 there is an increase in *lysyl oxidase* activity which results in thickening and stiffness of the collagen fibers so that the elasticity of the *flexor retinaculum* decreases and makes it unable to withstand changes in the pressure it receives.

This research shows that there is no significant relationship between *Body Mass Index* and the incidence of *Carpal Tunnel Syndrome* with a very weak level of relationship. The results of this study are inversely proportional to research by Fanny et al. which states that there is a significant relationship between *Body Mass Index* and the incidence of Carpal Tunnel Syndrome with a significance value of <0.05, this is caused by excessive *Body Mass Index* causing a buildup of fluid so that the contents of the *carpal tunnel* increase which then increases the risk factor for *Carpal Tunnel Syndrome*. Other research was conducted by Faisal et al. stated that there is a significant relationship between *Body Mass Index* and the incidence of *Carpal Tunnel Syndrome* with a significance value of 0.018, this is because an abnormal *Body Mass Index* is a risk factor for the occurrence of *Carpal Tunnel Syndrome* in the general population. Based on research conducted by Nadhifah et al. said that the more a person's weight increases, the more pressure the *median nerve* under the *transverse carpal ligament* will have, thereby increasing the risk factor for *Carpal Tunnel Syndrome* so that obese people have a 50% higher risk of developing Carpal Tunnel Syndrome than thin people.

This study shows that there is no significant relationship between the frequency of repetitive movements and the incidence of *Carpal Tunnel Syndrome* with a very weak level of relationship. The results of this research are inversely proportional to research by Ahmad which was conducted on stone crushing workers who worked for 7-8 hours/day, stating that there was a significant relationship between the frequency of repetitive movements and the incidence of *Carpal Tunnel Syndrome* with a significance value of 0.001 and a correlation the strong one. Subsequent research conducted by Indriani on workers in the crab production section who worked for 8-10 hours/day also stated that there were 80.6% of respondents who were at risk of experiencing *Carpal Tunnel Syndrome*. Subsequent research also conducted by Cindy on *repair veneer* workers who worked for 10-12 hours/day stated that there was a relationship between the frequency of repetitive movements and the incidence of *Carpal Tunnel Syndrome* with the probability that the frequency of repetitive movements on the right hand was 0.003 and on the left hand was 0.005. Based on the results of research conducted by Ahmad, Indriani, and Cindy, it appears that there is a strong relationship between the duration of a person's repetitive movements and the incidence of *Carpal Tunnel Syndrome*, this is the reason why in research conducted in Muara Untu Village, Murung Raya Regency, Central Kalimantan Province did not show a significant relationship because the frequency of repetitive movements carried out by women washing clothes by hand in Muara Untu Village, Murung Raya Regency, Central Kalimantan Province was less than 1 hour/day. Research by Richard and Moore states that the frequency of repetitive movements is a risk factor for *Carpal Tunnel Syndrome*. It is also said that the higher the frequency of repetitive movements in the hands, the higher the risk of *Carpal Tunnel Syndrome*. Direct pressure on soft muscle tissue also increases the risk of *Carpal Tunnel Syndrome*.

This research entirely used the researcher's own funds and no research conflicts were found in this research.

2. CONCLUSIONS AND SUGGESTIONS

The conclusion of this study is that there is a significant relationship between age and the incidence of *Carpal Tunnel Syndrome* with a weak level of relationship and there is no significant relationship between *Body Mass Index* and frequency of repetitive movements and the incidence of *Carpal Tunnel Syndrome* with a very weak level of relationship.

Suggestions for future researchers are to add certain criteria related to *Body Mass Index* classification and duration of repetitive movement frequency in the inclusion criteria.

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