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RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND HYPERTENSION LEVELS WITH OSTEOARTHRITIS IN THE ELDERLY USING WOMAC (The Western Ontario And Mcmaster Universities Osteoarthritis Index)

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ABSTRACT

Osteoarthritis is one _ disease joints usually degenerative _ happens with age further , marked with solving cartilage , change bone joints , damage bone joints , damage to tendons and ligaments . The risk factors for osteoarthritis are divided into 2, primary and secondary, one of which is physical activity and level of hypertension. The occurrence of osteoarthritis has an impact on limitations in social and spiritual interactions, decreased physiological abilities, decreased productivity, and psychological disorders. This study aims to analyze the relationship between physical activity and the level of hypertension with the incidence of osteoarthritis in the elderly using WOMAC. This study uses correlation analysis with a cross sectional approach . The independent variables are physical activity and the level of hypertension and the dependent variable is the incidence of osteoarthritis . The total population of this study was 184 elderly with a sample size of 34 elderly using purposive sampling technique . The instruments used were the observation sheet and the WOMAC questionnaire . The results showed that p value 0.436 > α 0.05 with this value indicating that there is no relationship between physical activity and the incidence of osteoarthritis in the elderly and also obtained test results showing that there is a relationship between the level of hypertension and the incidence of osteoarthritis in the elderly with a p value value 0.002 < α 0.05. So it can be concluded that there is no relationship between physical activity and the incidence of osteoarthritis in the elderly , but there is a relationship between the level of hypertension and the incidence of osteoarthritis in the elderly using WOMAC.
It is recommended for the public to better maintain an ideal body weight, diet, lifestyle and not too strenuous physical activities and exercise to reduce pain in the knee joints.

Keywords

Physical Activity, Hypertension Level, Occurrence of Osteoarthritis, WOMAC

INTRODUCTION

Everyone will experience the addition of age and enter the elderly phase. According to RI government regulation Number 43 of 2004, elderly (elderly) is someone who has reached the age of 60 years and over. Older people are more prone to health problems due to poor physical function due to aging. The process of aging is a process that leads to changes that include physical, psychological, social and mental

changes. Viewed from the health aspect, the elderly will experience a decrease in health status both naturally and due to disease. The decline in health that most often affects the elderly is degenerative diseases (Djawas & Isna, 2020).

One of the most common degenerative diseases is *osteoarthritis* . *Osteoarthritis* is a common joint disease that most often affects middle-aged to elderly people, which is characterized by breakdown of cartilage, changes in joints, damage to joints, damage to tendons and ligaments (Mutmainah & Makmun, 2019).

According to WHO, 2018 stated around 151 million people worldwide and reached 24 million people in the Southeast Asia region. According to Basic Health Research (Riskasdes, 2018), the prevalence of *osteoarthritis sufferers* in Indonesia reached 713,783 people, the prevalence in East Java reached 75,490 people, and the prevalence in Bangkalan reached 1,767 people (Riskesdas, 2018).

Based on a preliminary study in the working area of the Kwanyar Health Center, there were around 184 cases of *osteoarthritis* , in December 2022 the following data was obtained:

Table 1.1 number of cases of *osteoarthritis* in Kwanyar District

No	Village Name	Man	Woman
1	Tebul	5	7
2	West Kwanyar	3	6
3	boarding house	4	6
4	New coral	9	10
5	West brick	3	5
6	Batah east	4	4
7	Kateteng	3	5
8	Morombuh	5	7
9	Dlemer	3	5
10	Janteh	2	4
No	Village Name	Man	Woman
11	Paoran	5	5
12	Elang coral	7	7
13	view	5	5
14	Duwek butter	6	7
15	Well yellow	9	11
16	Mountain whine	8	9
	Total	81	103

Primary *source : Puskesmas Kwanyar , 2022*

The risk factors for *osteoarthritis* are divided into 2, primary and secondary. Primary factors such as age, gender, body mass index (BMI), obesity, anatomical factors, muscle weakness, and joint injuries (work/physical activity). Whereas secondary *osteoarthritis* occurs due to pre-existing joint disorders, including trauma or injury, congenital joint disorders, arthritis (such as *rheumatoid arthritis*), avascular necrosis, septic arthritis, *Paget disease* , osteoporosis, *osteochondritis dissecans* , metabolic disorders (hemochromatosis, *Wilson*), hemoglobinopathy, *Ehlers-Danlos syndrome* , or Marfan syndrome (Istiqomah, 2021).

The impact of *osteoarthritis* often occurs in the joints of the knee, one of which is a disorder in the joints caused by chronic degenerative factors which are characterized by abrasion of joint cartilage and the formation of new bone on the joint surface which can cause muscle and tendon weakness. This limits movement and causes pain. The emergence of this pain results in the emergence of limited movement and decreased functional activity in patients with *osteoarthritis* (Tripathi and Hande, 2017 *et al* 2019; Khruakhorn and Chiwarakranon, 2021).

In addition, *osteoarthritis* also occurs in people who have hypertension due to the effects of vascular injury. Hypertension causes the formation of *atherosclerotic* plaques which can lead to arterial occlusion and cause blood flow

stasis in the subchondral vessels, so that the exchange of nutrients and gases is disrupted into the articular cartilage which is a potential initiator of 3 degradative changes in cartilage (Hoeven, 2007 in Akbar, H 2019).).

According to Sinusas, 2012 in Washilah, et al, 2021, knee *osteoarthritis* is the main cause of pain and disability. In more severe degrees, pain can be felt continuously so that it greatly interferes with the patient's mobility (Alfrisi, 2018). Therefore the severity of knee *osteoarthritis* can be measured based on radiographic results (*Kellgren* and *Lawrance*) as well as measuring the functional ability of *osteoarthritis patients* using two instruments recommended by WHO to measure the severity of knee *osteoarthritis* based on clinical symptoms, namely the *Wastern Ontario And McMaster Universities Index* (WOMAC) (Kusuma, et al, 2019).

There are various ways of handling and prevention that can be done, such as giving pharmacological therapy and non-pharmacological therapy. Recommended pharmacological therapy such as administration of analgesics, local corticosteroids, systemic, corrective, biologics and also surgery. This pharmacological therapy is highly recommended in order to reduce pain, stiffness, swelling, and also early inflammation and can control these causative factors . The recommended non-pharmacological therapies such as education, physical therapy, diet or weight loss can also be done with warm compress therapy or with other herbal ingredients. In terms of providing this intervention, it is hoped that it can reduce the problems that occur in the elderly who suffer from *osteoarthritis* to increase and maintain independence in carrying out various activities. (*The American College of Rheumatology*. ACR, 2012)

METHOD

The method in this study uses correlation analysis with a cross sectional approach the population used was an average of knee osteoarthritis patients who were in the working area of the Kwanyar Health Center from October to December 2022 2 as many patients or an average of 184 patients per month, with a sample size of 34 people.

The sampling technique used in this study is probability sampling. This research has an update, namely by conducting independent checks using the WOMAC questionnaire and the statistical test used in this study is the purposive sampling correlation test .

RESULTS

General Data

Distribution Frequency Respondents Based on Age

Table 1 Distribution frequency respondent based on age in the health center area Kwanyar February 2023

Age	Frequency	Percentage (%)
Early Seniors	14	41.2
Late Seniors	17	50.0
seniors	3	8.8
Total	34	100

Source : Primary data, February 2023

Based on table 1 above, it was found that most of the respondents were in the early elderly with a percentage of 18 respondents (52.9%).

Frequency Distribution of Respondents by Gender

Table 2 Distribution of the frequency of respondents by gender in the Kwanyar Health Center area February 2023

Work	Frequency	Percentage (%)
Farmer	21	61.8
Housewife _ Ladder	13	38.2
Total	34	100

Source : Primary Data, February 2023

Based on table 2 above, it was found that the majority of respondents were female with a percentage of 24 respondents (70.6%).

Distribution Frequency Respondents Based on Work

Table 3 Distribution of the frequency of respondents based on work in the Kwanyar Health Center area February 2023

Type Sex	Frequency	ercentage (%)
Man	10	29.4
Woman	24	70.6
Total	34	100

Source : Primary Data, August 2022

Based on table 3 above, the data shows that most of the respondents work as farmers with a percentage of 21 respondents (61.8%).

Custom Data

Frequency Distribution of Respondents Based on Physical Activity

Table 1 Distribution of the frequency of respondents based on physical activity in the Kwanyar Health Center area February 2023

Activity Physique	Frequency	Percentage (%)
Light	4	11.8
Currently	17	50.0
Heavy	13	38.2
Total	34	100.0

Source : Primary Data, February 2023

Based on table 1 above, the data obtained is that, physical activity half of the respondents indicated that they were at a moderate level of activity with a percentage of 17 respondents (50.0%)

Frequency Distribution of Respondents Based on Hypertension Level

Table 2 Distribution of the frequency of respondents based on the level of hypertension in the working area of the Kwanyar Health Center.

Hypertension	Frequency	Percentage (%)
Pre Hypertension	18	52.9
Stage I hypertension	9	26.5
Stage 2 hypertension	7	20.6
Total	34	100.0

Source : Primary Data, February 2023.

Based on table 2 above, it shows that most of the patients who experienced pre-hypertension were 18 respondents with a percentage (52.9%).

Distribution Frequency Knee *Osteoarthritis* use *WOMAC*

Table 3 Distribution frequency *osteoarthritis* use *WOMAC* in the work area Public health center Kwanyar February 2023

Knee *Osteoarthritis*	Frequency	Percentage (%)
Light	11	32.4
Currently	19	55.9
Heavy	2	5.9
Very Heavy	2	5.9
Total	34	100.0

Source : Primary Data, August 2022

Based on table 3 above, it shows that most of the respondents had moderate knee *osteoarthritis* , with a percentage of 19 respondents (55.9%).

Cross Tabulation

Cross-tabulation of the Relationship between Physical Activity and Knee *Osteoarthritis* in the Elderly Using *WOMAC*

Table 1 Cross-tabulation of the relationship between physical activity and knee *osteoarthritis* in the Kwanya Health Center area, February 2023 using *WOMAC*

		Knee Osteoarthritis									
		Light		Currently		Heavy		Very Heavy		Total	
		F	%	F	%	F	%	F	%	F	%
Activity Physique	Light	0	0.0	0	0.0	2	5.9	2	5.9	4	11.8
	Currently	0	0.0	4	11.8	10	29.4	3	8.8	17	50.0
	Heavy	1	2.9	2	5.9	7	20.6	3	8.8	13	38.2
Total		1	2.9	6	17.6	19	55.9	8	23.5	34	100.0
		Spearman Rank Statistical Test α = 0.05 p = 0.436 r = -0.138									

Source : Primary Data, February 2023

Based on table 1 above , get explained that elderly in the health center Kwanya r part big experienced respondents _ *osteoarthritis* active knee _ physique heavy as many as 19 respondents with percentage (55.9%) and on activity physique half of the active data was obtained currently as many as 17 respondents with percentage (50.0 %) Of statistical test results *Spearman Rank* obtained mark *p Value* 0.436 means mark *p Value* = > α (0.05) . With a correlation coefficient of 0.138 so that H0 $_{is}$ accepted and H1 $_{is}$ rejected. This means that there is no relationship between physical activity and knee *osteoarthritis* in the Kwanyar Health Center area with a very low correlation level.

Cross-tabulation of the Relationship between Hypertension and Knee *Osteoarthritis* in the Elderly Using *WOMAC*

Table 2. Cross-tabulation of the relationship between hypertension and knee *osteoarthritis* in the Kwanya Health Center area, February 2023 using *WOMAC*

		Knee Osteoarthritis									
		Light		Currently		Heavy		Very Heavy		Total	
		F	%	F	%	F	%	F	%	F	%
Hypertension Level	Pre Hypertension	9	26.5	9	26.5	0	0.0	0	0.0	18	52,9
	Hypertension 1	1	2,9	7	20,6	1	2,9	0	0.0	9	26.5
	Hypertension 2	1	2,9	3	8,8	1	2,9	2	5,9	7	20,6
Total		11	32,4	19	55,9	2	5,9	2	5,9	34	100.0
		Spearman Rank Statistical Test α = 0.05 p = 0.000 r = 0.716									

Source : Primary Data, February 2023

Based on table 2 above, it can be concluded that almost half of the elderly with pre-hypertension with moderate WOMAC scores were 9 respondents (26.5%), and a small proportion of elderly people with stage 1 hypertension with moderate WOMAC scores were 7 respondents (20.6%) . From the results of the Spearman Rank statistical test, the results obtained were p = 0.002, meaning that the value of p = < α : 0.05 with a correlation value of 0.504. Thus it can be said that H1 is accepted. This means that there is a relationship between hypertension and the WOMAC score.

DISCUSSION

Description of Physical Activity in the Elderly in the Work Area of the Kwanyar Health Center

Based on the results of the study, it was shown that half of the respondents' physical activity was at a moderate activity level with a percentage of 17 respondents (50.0%).

According to the analysis of researchers, physical activity is exercise for the body to produce more energy and also to prevent joint stiffness so that the body can be healthier. The body also needs energy, which energy can be generated with light, moderate to heavy activities. With energy, it can prevent the body from stiffness, but if the activity is too heavy, it will also burden the body, especially the joints, because the joints are the parts the body needs to move. Therefore if the activity is too heavy it can have a bad impact on the body, especially on the joints.

This is in line with research (Sahrudi et al., 2019) which states that, someone who has osteoarthritis in the knee joint, will generally show a condition of weakness in the quadriceps muscles with a decrease in strength of 20-45% compared to normal people of different age and gender. The same. Quadriceps muscle weakness in knee osteoarthritis patients is clinically important, because it is associated with impaired knee stability dynamics and physical function. In addition, the quadriceps serve as an important protector of the knee joint which works eccentrically in the initial phase of gait to protect the knee joint and acts as a reducer of impulsive loads when walking or during other physical activities.

This is in line with research (Adithya, 2017) which states that physical activity includes body movements produced by skeletal muscles which result in increased energy expenditure that exceeds energy expenditure at rest. Meanwhile, according to Casperson physical activity is body movement resulting from skeletal muscles that result in increased energy expenditure.

From some of the definitions above, it can be concluded that physical activity is body movement produced by skeletal muscles accompanied by an increase in energy use.

Description of the Level of Hypertension in the Elderly in the Work Area of the Kwanyar Health Center

Based on research conducted at the Kwanyar Health Center, Bangkalan District, the results obtained from 34 respondents indicated that most of the patients had pre-hypertension, as many as 18 respondents.

The results of research (Ayling Soeryadi et al 2017) showed that there were more patients with knee OA in the group with pre-hypertension (51.9%) than normal blood pressure (33.3%) and stage 1 hypertension (14.8%). Overall this study showed that normal blood pressure (33.3%) was lower than patients with OA who came with pre-hypertension – *stage 1* hypertension (66.7%).

Narrowing of blood vessels due to hypertension can also reduce circulation to the *subchondral bone* . We observed significant bone loss at the *subchondral* plate on the medial tibial plateau, in terms of decreased bone mineral density and increased porosity, in patients with knee OA with hypertension and/or type 2 diabetes compared with subjects without these comorbidities. These findings indicate a potential biological relationship between bone loss in the subchondral plate in knee OA and comorbidities (Wen et al, 2012) in (Laksmitasari, 2021).

Researchers suggest that the blood vessels become narrower over time causing limited blood flow to the bone that lies beneath the joint cartilage, then the supply of

blood and nutrients to the cartilage can be adjusted, compensation occurs eventually causing slow damage to the cartilage.

Description of the Occurrence of Knee Osteoarthritis in the Elderly in the Work Area of the Kwanyar Health Center

Based on research conducted at the Kwanyar Health Center, Bangkalan District, the results showed that 34 respondents had moderate knee *osteoarthritis* , 19 respondents (55.9%) with 29 respondents being women.

Based on the results of the study (Arintika et al 2022) which was conducted on 55 respondents, who had already gone through the screening stage with inclusion and exclusion criteria, it was found that female respondents had 4 times greater risk than men. Because at the age of 55, women have a higher prevalence of osteoarthritis than men because women are entering menopause and their levels of estrogen and progesterone, which are initially balanced, decrease, resulting in fat accumulation due to incomplete combustion, bone loss and inelastic ligaments as a starting point for pain complaints . knee.

This is in line with research conducted by (Laksmitasari, 2021) which shows that most OA patients are aged ≤ 60 years (54.3%), this is appropriate that OA is a high disease when someone enters old age where one of the clinical criteria from *American College of Rheumatology* (ACR) 1986 is over 50 years of age. From the data obtained, most OA sufferers are early elderly. There were more female knee OA patients (57.1%) than men, from this figure the incidence of OA tended to be experienced by women.

In addition, these results are also similar to a study by Elvana (2017) in (Laksmitasari, 2021) at Surabaya Hospital Hospital in 160 OA patients with the Spearman correlation test between age and degree of osteoarthritis of the knee joint according to Kellgren and Lawrence, a significant relationship was found between age and degree osteoarthritis of the knee joint according to Kellgren and Lawrence (p=0.001). *Osteoarthritis* (OA) is an age-related degenerative disease. It is often described as a chronic disease and is considered by many to be an unavoidable consequence of growing old. The aging process results in an imbalance in chondrocyte signaling. In OA cartilage, it appears that inflammatory and catabolic signals outweigh anti-inflammatory and metabolic signals. This signaling imbalance increases the production of matrix-degrading enzymes by chondrocytes, including *matrix metalloproteinases* (MMPs), *aggrecanases* and other proteases that degrade cartilage matrix (Loeser, 2010). This results in reduced ability of chondrocytes to respond to growth factor stimulation in elderly patients and less responsive osteoarthritic cartilage to convert TGF β and insulin-like growth factor-1. Ultimately, there is thinning of the joint space due to thinning of the cartilage, subchondral cysts develop, while the cartilage loosens due to synovial inflammation, followed by the formation of new bone orosteophytes (Anderson & Loeser, 2010).

According to the researcher's analysis, this situation is also in accordance with the conditions in the field. Where, women are more dominant than men. Women have a higher prevalence than men because during menopause there is a decrease in estrogen levels.

The Relationship between Physical Activity and the Occurrence of Knee Osteoarthritis in the Elderly in the Working Area of the Kwanyar Health Center

Based on the results of the study, the results of the *Spearman Rank statistical test*

obtained a *p value of* 0.436, meaning that *the p value* = > α (0.05) . With a correlation coefficient of 0.138 so that H0 $_{is}$ accepted, H1 $_{is}$ rejected. This means that there is no relationship between physical activity and knee *osteoarthritis* in the Kwanyar Health Center area with a very low correlation level.

Researchers are of the opinion that there are many factors that have a risk of *osteoarthritis* , not only physical activity, because there are other factors such as body mass index, smoking, and so on, there are also factors that cannot be changed such as genetic factors, and diabetes. There are many other factors that can increase the risk of *osteoarthritis* , so it cannot be concluded that physical activity is the main cause of *osteoarthritis.*

This is in line with Hsu & Siwiec's research (2020) that the prevalence of knee *osteoarthritis* in women has a greater risk factor for knee *osteoarthritis* than men. Older women have an increased risk of knee *osteoarthritis* because it is associated with decreased levels of the hormone estrogen, less cartilage volume, and greater loss of articular cartilage elasticity than men.

This is also in line with research (Duha, 2019) the number of respondents who were female was more than male, namely 26 people (78.8%) of 33 respondents. In this case, it shows that most of the respondents who are prone to experiencing *knee osteoarthritis* are female because more women have the habit of working with heavy loads, strenuous physical activity where the level of joint use is higher but the ability of cells to regenerate decreases and reduced muscle ability. where from the data obtained by the researchers most of the female respondents worked as housewives (IRT), and also the role of sex hormones affecting the increase in *osteoarthritis rates* during or immediately after menopause in women.

The Relationship between Hypertension Level and the Occurrence of Knee Osteoarthritis in the Elderly in the Work Area of the Kwanyar Health Center

Based on the results of the study, it was found that there was a relationship between hypertension and the incidence of *osteoarthritis* using *WOMAC with the Spearman Rank* statistical test results obtained *p value* = 0.002, meaning that *p value* = < α : 0.05 with a correlation value of 0.504.

Many risk factors cause *osteoarthritis* , one of which is hypertension due to the effects of vascular damage. Hypertension is defined as systolic blood pressure >140mmHg and/or diastolic blood pressure >90mmHg. Hypertension causes arterial occlusion and causes static blood flow in the subchondral vessels, a subchondral ischemia occurs so that the exchange of nutrients and gases is disrupted into the articular cartilage which becomes a potential initiator of degradative changes in cartilage. Research conducted by Ishaan Vohra et al in 2015, showed a significant relationship between hypertension and *osteoarthritis* .

Based on research conducted by (Laksmitasari, 2021) the relationship between hypertension and the degree of KL, patients who suffer from grade 3-4 (moderate-severe) knee OA suffer more from OA patients who do not experience hypertension (70%), while patients with grade OA 1-2 (doubtful) the number is the same between patients who suffer from hypertension and do not suffer from hypertension. The test results showed that the p value was 0.797 (> 0.05), which means that there was no relationship between hypertension and the degree of KL. In contrast to a similar study by Azmi (2016) regarding the relationship between the degree and length of suffering from hypertension and the severity of knee

osteoarthritis at RSUDZA Banda Aceh in 58 OA patients, it was found that all patients had a history of hypertension with the most degree I and the duration of hypertension was 1-10 years with statistical analysis. obtained p value = 0.00 so that there is a significant relationship where grade 1 hypertension can lead to the development of knee OA 4.2 times more at risk of becoming grade 1-2 while grade II hypertension can cause development of knee OA 12 times more at risk of becoming grade 3-4.

According to researchers, the occurrence of *osteoarthritis* caused by hypertension is due to the effects of the vascular damage it causes. Thus causing atherosclerosis which can cause arterial occlusion thus causing blood flow in the subchondral vessels to be disrupted. The amount of blood pressure is different so that it will cause pain when standing and walking so that it is possible for knee *osteoarthritis to occur* in the elderly.

CONCLUSION

Based on the research that has been done, the following conclusions can be drawn:

a. Half of the respondents showed a moderate level of physical activity as many as 17 elderly people with a percentage of 50% in the working area of the Kwanyar Health Center
b. Most of the respondents experienced pre-hypertension as many as 18 elderly people with a percentage of 52.9% in the working area of the Kwanyar Health Center
c. Most of the respondents experienced knee *osteoarthritis* as many as 19 elderly with a percentage of 55.9% in the working area of the Kwanyar Health Center.
d. The existence of risk factors for the occurrence of *osteoarthritis* is not only triggered by physical activity as the main cause, but there are other factors, so that a very low correlation level is obtained, therefore, there is no relationship between physical activity and the occurrence of *osteoarthritis* in the working area of the Kwanyar Health Center
e. There is a relationship between the level of hypertension and the incidence of *osteoarthritis* in the elderly using *WOMAC* in the working area of the Kwanyar Health Center.

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