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The effect of physiotherapy on pain improvement in patients with early knee osteoarthritis at RSU UKI

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Abstract
Osteoarthritis (OA) is a degenerative joint disease related to joint cartridge damage. Several OA risk factors are age, sex, race, genetics, obesity and metabolism disease, joint injury occupation and sports, growth disorders, and other factors. The modality generally used to reduce pain, joint tension, and fighting muscle atrophy in knee OA is completing several physiotherapies. One objective study case research by using purposive sampling and conducting an interview with knee OA patients. The T-test evaluation result of the physiotherapy influence to pain reduction in osteoarthritis found that there is before (33,5) and after (22,00) mean decrease with deviation standard before (6,704) and after (3,258) the therapy. Thus, physiotherapy influenced towards reducing pain osteoarthritis.

Keywords: osteoarthritis, physiotherapy

Introduction

Between 2015 and 2050, the proportion of the elderly is expected to double from 12% to 22%. It is an unexpected increase from 900 million to 2 billion people by the age of 60—the elderly face unique physical and mental health problems. There are 125 million people aged 80 years and over. (World Health Organization, 2015) [1]. Several studies show that the prevalence rate of elderly with osteoarthritis is around 58%. The prevalence of OA varies according to the OA definition, the specific joint being studied, and the characteristics of the study population. The age standard prevalence of radiographic knee OA in adults age 45 was 19.2% among participants in the Framingham Study and 27.8% in Johnston County Osteoarthritis. In the third Health and Nutrition Examination Survey (NHANES III), approximately 37% of participants aged >60 years or older had radiographic knee OA [2]. The prevalence of educated standard radiography of OA was 27.2% among Framingham participants. Radiographic OA of the hip is less common than OA of the hand or knee. For example, approximately 7% of women 65 years of age in the Osteoporosis Fracture Study had radiographic OA of the hip. However, the prevalence of hip OA is much higher in Johnston County, with 27% of subjects at least 45 years of age showing radiographic evidence of K/L grade 2 or higher OA [3].

Symptomatic OA is generally defined by pain, tenderness, or stiffness in the joints with radiographic OA. The mean age prevalence of symptomatic and symptomatic OA was 6.8% and 4.9% in Framingham subjects aged 26 years. However, the prevalence of symptomatic knee OA was 16.7% among subjects age 45 in the Johnston County Osteoarthritis Project, significantly higher than that reported in the Framingham Study. Approximately 9% of subjects in the Johnston County study had symptomatic OA [2]. Osteoarthritis is no longer considered a degenerative disease, but age is still a risk factor. Age over 65 years, only 50% provide radiological features according to osteoarthritis. However, only 10% of men and 18% of women show clinical symptoms of OA, and about 10% have a disability because of their OA. It can be understood if the older you get, the more you get older high the probability of developing OA.

Along with increasing life expectancy, according to WHO, in 2025, the elderly population in Indonesia will increase by 41.4% compared to 1990. In Indonesia, the prevalence of radiologically visible knee OA reaches 15.5% in men and 12.7% in women aged between 40-60 years. Research in Bandung on patients who went to the RSHS rheumatology clinic in 2007 and 2010, respectively, found: OA was 74.48% of all cases (1297) of rheumatism in 2007. Sixty-nine per cent of them were women, and most were women. is knee OA (87%). Furthermore, from 2760 cases of rheumatism in 2010, 73% of them were sufferers of OA. Thus OA will be more and more found in the daily practice of doctors [3]. OA is a chronic, long-term disease characterised by the deterioration of the cartilage in the joints, causing the bones to rub against each other and create stiffness, pain, and impaired movement. The disease most commonly affects the joints in the knees, hands, feet, and spine and is relatively common in the shoulder and hip joints. While OA is associated with ageing, it is also associated with various modifiable and nonmodifiable risk factors, including obesity, lack of exercise, genetic predisposition, bone density, occupational injuries, trauma, and gender [4].

Osteoarthritis is a degenerative joint disease, which mainly affects the articular cartilage. It is associated with ageing and is most likely to affect joints constantly stressed throughout the year, including the knees, hips, fingers, and lower back area [4]. OA has a multifactorial aetiology and can be thought of as the result of systemic interactions. For example, a person may have an inherited predisposition to develop OA but may only develop it. The importance of relative risk factors varies for different joints, for different stages of the disease, progression as opposed to disease progression, and radiographic disease versus symptoms. Some evidence suggests that risk factors may act differently according to individual radiographic features, such as

osteophytes and joint space narrowing [5].

The general characteristics of patients diagnosed with osteoarthritis joint disease showed that age, gender, obesity, race/genetic, and joint trauma were correlated with osteoarthritis. Furthermore, the prevalence of osteoarthritis increases dramatically among people over 50 years of age. Due to age-related changes in collagen and proteoglycans decrease joint cartilage tension and reduce nutrient supply to cartilage [5].

Osteoarthritis is currently diagnosed by physical examination and, if necessary, by x-ray, MRI scan and arthroscopy. However, this diagnostic tool has low sensitivity and specificity. Therefore, there are no biomarkers for OA that can be used in clinical practice at this time. Treatment of OA involves: treating associated pain; viscosupplementation with intra-articular injections of hyaluronate; intra-articular corticosteroid injections; joint replacement surgery; and, in rare circumstances, implantation of autologous chondrocyte into the damaged area [6]. Physiotherapy is one part of the medical team that is responsible for health development. In addition, physiotherapy has a role in developing, maintaining and restoring movement and body function throughout the life cycle by using manual handling or with equipment such as electrotherapy and mechanics.

For some of the background of these problems, it is interesting to study and understand physiotherapy management in cases of knee osteoarthritis. Physiotherapy modalities that can reduce pain in knee joint osteoarthritis use Transcutaneous Electrical Nerve Stimulation (TENS) as a modality to reduce pain, both acute and chronic. TENS can increase the threshold for dull pain, but not sharp pain [7]. Infra-ed (IR) stimulates vasodilation of blood vessels, and heat energy is received by sensory nerve endings, which are then influenced by a heat-regulating mechanism. With this increased blood circulation, the provision of nutrients and oxygen increases to increase red blood cells and antibodies in the tissues. Thus the tissue will become better, and the resistance to the causative agent of the inflammatory process will also get better [4]. In addition, exercise therapy can help maintain, maintain and increasing muscle strength and joint range of motion [4].

Problems that arise in knee osteoarthritis are Impairment, Disability, Functional Limitations in the form of pain, limited ROM, decreased muscle strength, limitations in long walking activities such as squatting, standing and climbing stairs, decreased work endurance, potential complaints. Occurs in these conditions such as deformities, contractures etc. The formulation of the problem answered in this study was "is there an effect of physiotherapy on reducing pain in knee OA?" and "is there any effect of giving Physiotherapy to improve functional ability in knee OA conditions?". It is done to know the effect of giving physiotherapy on reducing pain in the condition of knee osteoarthritis and to determine the effect of giving physiotherapy on increasing functional ability in knee osteoarthritis.

Literature Review

The femur is a long bone that joins up with the pelvis and down with the tibia. The femur consists of the proximal diaphysis epiphysis and the distal epiphysis. In this femur bone that functions in the knee joint is the distal epiphysis. The epiphysis distalis is a pair of spheres called the lateral and medial femoral condyles. In addition, there is a small sphere called the lateral epicondyle and lateral epicondyle in the proximal part of the bulge. View from the front, there is a joint plane that extends laterally called the fades patellar, which later joins the patella bone.

Furthermore, a view from behind, between the lateral and medial condyles, is a depression called the intercondyloid fossa. The patella is a flat triangular bone with the apex facing distally. The front surface is rough, while the inner or dorsal surface has joint surfaces, namely broad lateral articular fades and narrow medial articular fades [8].

The tibia consists of the proximal epiphysis, the distal diaphysis. The proximal epiphysis of the tibia consists of two spheres called the lateral condyle and the medial condyle on which there is a joint plane called the lateral and medial articular fades, separated by the ementio iniercondyloidea. The knee is a joint whose shape can be said to have no conformity in shape. The two condyles of the femur together form a kind of pull lever like a pulley (trochlea). Preferably the flat tibia surface is uneven. The shape of the meniscus compensates for this discrepancy. The connections between these bones form a joint is called the articulatio patella femoral. The connection between the tibia and the femur is called the articulatio tibiofemoral. Which as a whole can be said as a knee joint or knee joint [8].

The fibula is a long, small bone located laterally and the tibia also consists of three parts: the proximal epiphysis, the diaphysis and the distal epiphysis. The proximal epiphysis is rounded, called the capitulum fibula, which tapers proximally to become the apex of the fibula capitalism. In the capitulum, there are two planes called fades articularis capitula fibula to joint with the tibia. The diapophysis has four crista lateralis, crista medialis, crista lateral and posterior fades. Finally, the epiphysis distalis rounded laterally is called the lateral malleolus (outer ankle) [8].

Ligaments have extensibility and strength properties, which are strong (tensile strength), serving as a movement limiter and joint stabiliser. There are several ligaments of the knee joint, namely: a) The anterior cruciate ligament, which runs from the front of the culimentio intercondyloidea of the tibia to the medial surface of the lateral condyle of the femur, which functions to resist hyperextension and prevent the tibia from sliding forward; b) The posterior cruciate ligament runs and fades laterally from the medial condyle of the femoris to the intercondyloid fossa of the tibia, preventing the tibia from sliding backwards; c) The lateral collateral ligament that runs and the lateral epicondyle to the fibula capitulum which functions to resist the movement of the varus or the outer side; d) The medial collateral ligament runs from the medial epicondyle to the medial surface of the tibia (medial epicondyle of the tibia) to resist valgus or side movements in exhortation. At the same time, however, the functions of the collateral ligaments hold the tibia forward in a 90° knee position; e) The oblique popliteal ligament originates from the lateral condyle of the femur to the insertion of the semimembranosus muscle attached to the fascia of the popliteal muscle, and f) The transversal genu ligament stretches on the anterior surface of the medial and lateral meniscus [8].

Osteoarthritis (OA) is a degenerative joint disease that involves cartilage, joint lining, ligaments, and bones, causing pain and stiffness in the joints. Osteoarthritis comes from the Greek words osteon, which means bone, arthro, which means joint, and itis, which means inflammation even

though people with osteoarthritis experience inflammation or only have mild inflammation. OA is a chronic joint disorder caused by an imbalance in the synthesis and degradation of joints, extracellular matrix, chondrocytes and subchondral bone in old age. Osteoarthritis is simply defined as a degenerative joint disease in the Indonesian Rheumatology Association due to a chronic inflammatory process in the joints and bones around the joint [9].

Primary osteoarthritis or idiopathic OA has no known cause and is not associated with systemic disease or local changes in the collaborative process. However, primary osteoarthritis is widely associated with ageing. In the elderly, the water volume of the young bone increases and the protein composition of the bone degenerates. Eventually, the cartilage begins to degenerate by sloughing off or forming small, young bones. In advanced cases, there is the complete loss of the cartilage cushion between the bones and joints. Repeated use of worn-out joints over the years can irritate and inflame the bone cushions, causing joint pain and swelling. This loss of bone cushioning causes friction between the bones, leading to pain and limited joint mobility. Inflammation of the cartilage can also stimulate the growth of new bone growth that forms around the joints. Primary osteoarthritis can include peripheral joints, interphalangeal joints, large joints (hips, knees), small joints (carpometacarpal, metacarpophalangeal), apophyseal and intervertebral joints in the spine. It is as well as other variations, such as erosive inflammatory OA, generalised, generalised OA, patellar chondromalacia, or Diffuse Idiopathic Skeletal Hyperostosis (DISH) [10, 11, 12].

Secondary osteoarthritis is OA caused by other diseases or conditions such as post-traumatic, congenital and growth disorders (both local and generalised), bone and joint disorders, diseases due to calcium deposits, endocrine, metabolic, inflammatory disorders, prolonged immobility, as well as other risk factors such as obesity, repeated operations on joint structures, and so on [13, 14, 15].

In Asia, China and India are ranked in the top 2 as countries with the highest epidemiology of osteoarthritis, namely 5,650 and 8,145 people suffering from knee osteoarthritis, respectively. The 2013 Basic Health Research (Riskesdas) data from interviews at the age of 15 had an average prevalence of joint/rheumatic diseases of 24.7%. The province of East Nusa Tenggara (NTT) is the province with the highest prevalence of OA, which is around 33.1%, and the province with the lowest prevalence is Riau, which is around 9%, while in East Java, the prevalence rate is relatively high, which is around 27% (Riskesdas, 2013) [2]. Around 32.99% of the elderly in Indonesia complain of degenerative diseases such as gout, rheumatism/arthritis, high blood pressure, low blood pressure, and diabetes (Data and Information Center of the Indonesian Ministry of Health, 2013). 56, 7% of patients in the rheumatology polyclinic of Dr Cipto Mangunkusumo, Jakarta was diagnosed with osteoarthritis. Symptoms of knee OA are higher in women than in men, namely 13% in women and 10% in men. the risk of developing knee OA is approximately 40% in men and 47% in women [2].

Osteoarthritis is the last clinical condition that often arises from various disease processes. In the view of the past, it was considered primary if no precipitating cause could be identified or secondary if any pre-existing source was known. In other cases, OA is considered to be a condition mainly mediated by excessive mechanical stress passing through the joint. Risk factors for OA are usually separated into those related to disease progression (OA incidence) or disease progression. The main factors associated with OA incidence are ageing, previous trauma, genetic predisposition, and obesity. Most studies have focused on both the knee and hip; Major factors include mechanics, quadriceps and intra-articular muscle strength and spinal cord features [16, 17, 18].

Studies have shown that OA involves the entire joint structure and that it is a degenerative joint disease, and biomechanics has an essential role in disease onset and progression. These findings (for example, in people with medial OA symptoms that are overloaded in the medial compartment, knee OA progression is associated with biomechanical load, and altered knee load related to pain severity) have helped improve understanding of disease progression and strategies used to alter the course of the disease [19, 20].

Osteoarthritis has been seen as a result of an unavoidable ageing process. However, experts now state that OA is a disorder of the homeostasis of cartilage metabolism with damage to the cartilage proteoglycan structure whose cause is unknown. Mechanical and chemical injury is an essential factor that stimulates the formation of abnormal molecules and cartilage degradation products in the joint's synovial fluid, resulting in joint inflammation, chondrocyte damage, and pain. Mechanical and chemical injuries to the synovial joints that occur are multifactorial, among others due to age, humoral, genetic factors, obesity, mechanical stress or excessive joint use, and anatomic defects [21, 22].

Joint cartilage is the main target of degenerative changes in OA. This joint cartilage generally functions to create friction-free joint movement because it is immersed in synovial fluid and as a "shock absorber", resisting the weight of the bone. In OA, there is a disruption of the homeostasis of cartilage metabolism resulting in damage to the cartilage proteoglycan structure, cartilage erosion, and decreased joint fluid. Joint cartilage is formed by chondrocyte cells and an extracellular matrix, mainly composed of water (65%-80%), proteoglycans, and collagenous tissue. Chondrocytes function to synthesise soft tissue collagen type II for joint reinforcement and proteoglycans to make the tissue elastic and maintain the cartilage matrix so that the function of the cartilage cushioning joints is appropriately maintained. Cartilage does not have blood vessels, so that the repair process in cartilage is different from other tissues. In cartilage, the stage of repair is minimal given the lack of vascularity and the previous inflammatory response [23].

In general, cartilage will undergo replication and produce a new matrix to repair itself due to mechanical or chemical injury. However, in this case, chondrocytes fail to synthesise a quality matrix and maintain a balance between degradation and synthesis of the extracellular matrix, including excessive production of collagen types I, III, VI, and X and short synthesis of proteoglycans. As a result, there is a change in the diameter and collagen fibres orientation, altering the cartilage biomechanics so that the joint cartilage loses its compressibility properties.

Some conditions, such as trauma / mechanical injury, will induce the release of degradation enzymes, such as stromelysin and Matrix Metalloproteinases (MMP). Stromelysin degrades proteoglycans, while MMP degrades extracellular matrix proteoglycans and collagen.

Chondrocytes produce mMPs, then activated via a cascade involving serine proteinases (plasminogen activators), free radicals, and several membrane-type MMPs. This enzymatic cascade is controlled by various inhibitors, including TIMP and inhibitors of plasminogen activator. Tissue inhibitors of metalloproteinases (TIMP) that generally function to inhibit MMP cannot work optimally because they tend to be acidic in the joint cavity due to stromelysin (pH 5.5) TIMP can only work optimally at pH 7.5.

Agrecanase will break down proteoglycans in the articular cartilage matrix called aggrecan. There are two types of agrecanase, namely agrecanase 1 (ADAMT-4) and agrecanase 2 (ADAMT-11). Other enzymes contributing to the breakdown of type II collagen and proteoglycans are cathepsins, which act at low pH, including aspartate proteinases (cathepsin D) and cysteine proteinases (cathepsins B, H, K, L and S) which are stored in chondrocyte lysosomes. Hyaluronidase is not present in articular cartilage, but other glycosidases contribute to the breakdown of proteoglycans. In osteoarthritis, inflammatory mediators play a role in disease progression. In addition to the release of degradation enzymes, pro-inflammatory factors are also induced and released into the joint cavity, such as Nitric Oxide (NO), IL-1β, and TNF-α. These cytokines induce chondrocytes to produce proteases, chemokines, and eicosanoids such as prostaglandins and leukotrienes by attaching to receptors on the surface of chondrocytes and causing transcription of the MMP gene so that the production of these enzymes increases. As a result, matrix synthesis is inhibited, and cell apoptosis is increased. The most crucial cytokine is IL-1. IL-1 plays a role in reducing collagen types II and IX synthesis and increasing the synthesis of collagen types I and III, resulting in a poor quality articular cartilage matrix. The subchondral bone will also play a role at the end, where osteoblasts will be stimulated and produce proteolytic enzymes [24, 25].

Physiotherapy or physical therapy started in the 2500 BC century in China in acupuncture and various manual therapy techniques. The use of physiotherapy has also been recorded in "Ayurveda", which is the oldest medical system and is still practised and recognised by India as part of the country's health system. In western medicine, recorded in 460 BC, Hippocrates has described massage and hydrotherapy as alternative healing of various diseases. In the modern era, physiotherapy began to be widely developed in 1896 in London, which initially aimed to increase patients' mobility who were hospitalised to maintain muscle strength and function. The science of physiotherapy then developed rapidly and began to standardisestandardize the service and profession of physiotherapy, which was mainly based on modern medical science. In 1920 began to be formed associations of physiotherapists in England, followed by various other countries. World War I and II also influenced the development of physiotherapy science and services were. At that time and after the war, there was an increasing need for care and rehabilitation of war victims.

Research Method

The research is a one-target case study. Location The research was conducted at the medical rehabilitation clinic of RSU.UKI. The populations used in this study are all men & women aged 55-65 years with OA and have been treated five times. The sampling method in this study uses purposive sampling, namely the method of determining the sample by selecting specific samples that are judged to be following the objectives or research problems in a population. Data obtained from surveys and direct measurements in the field, namely data about physiotherapy for Osteoarthritis patients. Data obtained from libraries, journals, articles and internet media related to the object of research. Data collection methods used in this study include measurement, interviews, observation, and documentation. The data collection technique uses primary data, and namely, after the questionnaire sheets are distributed to the respondents, the sheet will be taken on the same day for later processing. Data collection instruments The instruments used in this study were questionnaires and informed consent before distributing the questionnaires. The data obtained is processed using software with the type of software SPSS version 21 or above.

Result and Discussion

This section will describe the characteristics of the respondents, which will be presented in tables and pie charts. The following are the results of calculations based on the results obtained from the questionnaire. The following are the tabulation results of the distribution of the characteristics of the research respondents carried out on respondents based on the characteristics of age respondents.

Table 1: Age distribution of osteoarthritis patients undergoing physiotherapy in RSU UKI 2017

Age		Frequency	%	Valid Percent	Cumulative Percent
	49	1	3,3	3,3	3,3
	51	1	3,3	3,3	6,7
	53	1	3,3	3,3	10,0
	54	1	3,3	3,3	13,3
	56	1	3,3	3,3	16,7
	57	3	10,0	10,0	26,7
	60	3	10,0	10,0	36,7
	61	3	10,0	10,0	46,7
	62	2	6,7	6,7	53,3
Valid	63	3	10,0	10,0	63,3
	64	3	10,0	10,0	73,3
	67	1	3,3	3,3	76,7
	68	1	3,3	3,3	80,0
	70	2	6,7	6,7	86,7
	74	1	3,3	3,3	90,0
	75	1	3,3	3,3	93,3
	78	1	3,3	3,3	96,7
	86	1	3,3	3,3	100,0
	Total	30	100,0	100,0	

Based on the table above regarding the tabulation of respondents' characteristics by age, it can be seen that the most significant number of respondents were aged 57-61 and 63-64 years, with an average number of 3 respondents or 10.0%. The following are the results of the tabulation of the distribution of the characteristics of the research respondents conducted on respondents based on the characteristics of respondents' gender.

Table 2: Gender distribution of osteoarthritis patients undergoing physiotherapy at RSU UKI in 2017

		Frequency	Per cent	Valid Percent	Cumulative Percent
	Male	5	16,7	16,7	16,7
Valid	Female	25	83,3	83,3	100,0
	Total	30	100,0	100,0	

Based on the table above regarding the tabulation of respondents' characteristics by gender, it can be seen that the number of respondents with male sex is five respondents or 16.7% and the number of female respondents is 25 respondents or 83.3%. The following are the tabulation results of the distribution of the characteristics of the research respondents that have been carried out on respondents based on the characteristics of respondents, namely education.

Table 3: Educational distribution of osteoarthritis patients undergoing physiotherapy at RSU UKI in 2017

		Frequency	Per cent	Valid Percent	Cumulative Percent
	Diploma	5	16,7	16,7	16,7
Valid	Bachelor	9	30,0	30,0	46,7
	Primary	3	10,0	10,0	56,7
	Senior High School	12	40,0	40,0	96,7
	Junior High School	1	3,3	3,3	
	Total	30	100,0	100,0	

Based on the table above regarding the tabulation of respondents' characteristics based on education, it can be seen that the highest number of respondents had a high school education level, namely 12 respondents or 40.0%, and the least number of respondents was junior high school, namely one respondent or 3.3%. The following are the tabulation results of the characteristics distribution of the research respondents that have been carried out on the respondents based on the characteristics of the respondents, namely occupation.

Table 4: Occupational distribution of osteoarthritis patients undergoing physiotherapy at RSU UKI in 2017

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Housewife	21	70,0	70,0	70,0
	Employee	1	3,3	3,3	73,3
	Retired	5	16,7	16,7	90,0
	entrepreneur	3	10,0	10,0	100,0
	Total	30	100,0	100,0	

Based on the table above regarding the tabulation of respondents' characteristics by occupation, it can be seen that the most significant number of respondents were housewives, namely 21 respondents or 70.0%, and the least number of respondents was employees, namely one respondent or 3.3%. The following are the tabulation results of the distribution of the characteristics of the research respondents that have been carried out on respondents based on the characteristics of respondents, namely many therapies.

Table 5: Distribution of many therapies for osteoarthritis patients who underwent physiotherapy at RSU UKI in 2017

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	>6 Times	30	100,0	100,0	100,0

Based on the table above regarding the tabulation of respondents' characteristics based on many therapies, it can be seen that all respondents underwent therapy > 6 times, namely 30 respondents or 100.0%. The following are the results of the tabulation of research respondents distribution that have been carried out on the respondents based on the characteristics of the respondents, namely the physiotherapy they underwent.

Table 6. Distribution of physiotherapy underwent by osteoarthritis patients at RSU UKI in 2017

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	TENS	30	100,0	100,0	100,0

Based on the table above regarding respondents' characteristics tabulation based on the physiotherapy they underwent, it can be seen that all respondents underwent TENS therapy, as many as 30 respondents or 100.0%.

Bivariate Analysis - This section will examine the relationship between two variables. In addition, to prove whether there is a significant relationship between the two variables, a paired t-test was conducted. The following are the results of calculations based on data obtained from the questionnaire. Normality Assumption Test - The main requirement for data to perform paired t-test analysis is to meet the normality assumption test. Normality test using histogram graph. If the movement of the data pattern follows a diagonal line, it can be stated that the research data is typically distributed. The criteria for decision making with graphical analysis (average probability) are as follows:

a. If the data spread around the diagonal line and follows the diagonal direction, then the regression model meets

the assumption of normality.

b. If the data spreads far from the diagonal line, then the regression model does not meet the assumption of normality.

The results of the normality test can be shown in the image below:

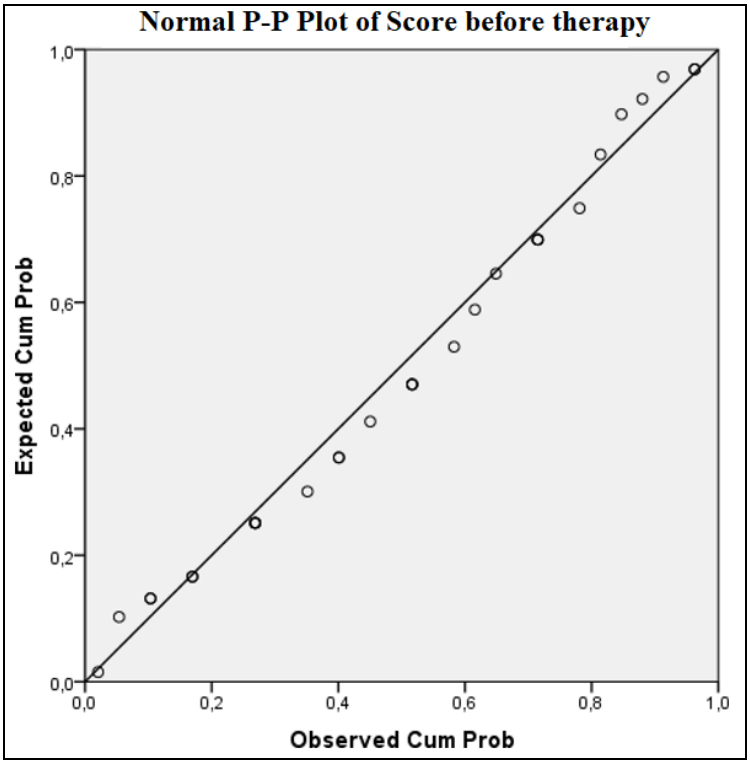

Fig 1: P-P Plot Score before Therapy

The P-P Plot diagram is one of the tools used to check the normality of the data. The normal distribution will form a straight diagonal line, and plotting data will be compared with the diagonal line. From the picture above, it can be seen that the plotting of data after white tea treatment spreads around the diagonal line and follows the direction of the diagonal line. It can be concluded that the data meets the standard assumption.

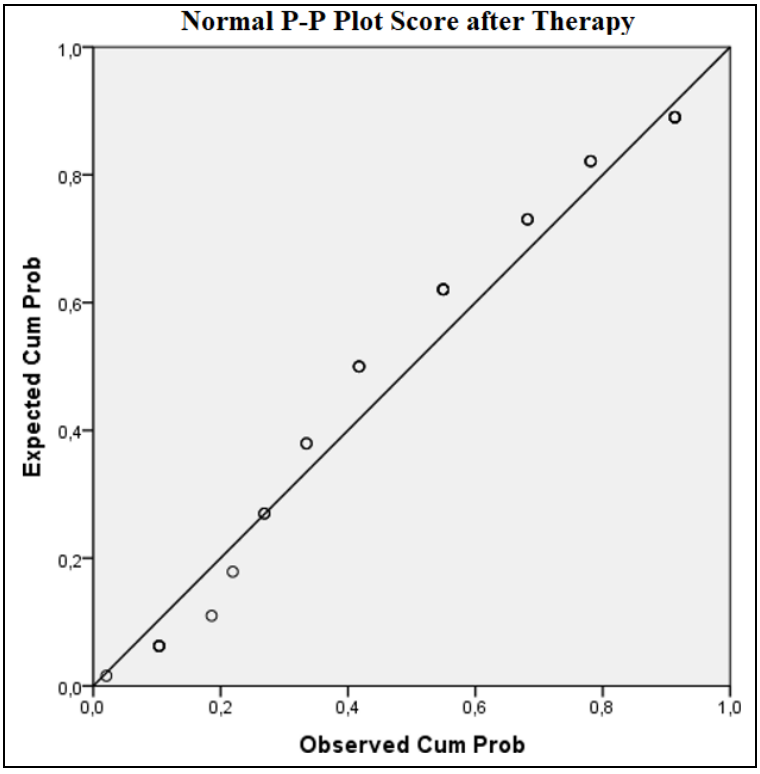

Fig 2: P-P Plot Score after Therapy

The P-P Plot diagram is one of the tools used to check the normality of the data. The normal distribution will form a straight diagonal line, and plotting data will be compared with the diagonal line. From the picture above, it can be seen that the plotting of data after black tea treatment spreads around the diagonal line and follows the direction of the diagonal line. It can be concluded that the data meets the typical assumption.

Hypothesis Testing - This hypothesis testing aims to determine whether or not there is an effect of physiotherapy on recovery in Osteoarthritis patients. The formulation of the first hypothesis is as follows.

Ho: There is no effect of physiotherapy on recovery in Osteoarthritis patients.

Ha: There is an effect of physiotherapy on recovery in Osteoarthritis patients.

Paired Samples Statistics

Table 7: T-test results on the effect of physiotherapy on recovery in Osteoarthritis patients using paired sample t-test

	Mean	N	Std. Deviation	Std. Error Mean
Score before Therapy	33,5000	30	6,70435	1,22404
Pair 1				
Score after Therapy	24,0000	30	3,25894	,59500

Paired Samples Correlations

Table 8

		N	Correlation	Sig.
Pair 1	Skor before therapy and after therapy	30	,655	,000

Based on the table above, the results obtained are that the mean table before therapy was 33.5 after therapy 24.00 with a standard deviation before therapy 6.704 after therapy 3,258.

At the same time, the value of the correlation coefficient is 0.655, with a p-value of 0.000.

Paired Samples Test

Table 9

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std.Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Score before therapy - Score after therapy	9,50000	5,19117	,94777	7,56158	11,43842	10,023	29	,000

From the t-test table above, it can be simplified as the table below:

Table 10

Periode	Score	t-Statistik	*p-value*
Before	33,500	10,023	0.000
After	24,000		

Based on the table above, the t-count value for statistical test scores before therapy and scores after therapy is 10.023, and the probability is 0.000 where the value is less than 0.00 (p-value <0.05). Thus Ho is rejected, meaning that there is a relationship between physiotherapy and pain reduction. Thus the hypothesis states that "There is an effect of physiotherapy on recovery in Osteoarthritis patients".

Based on testing the hypothesis above, it shows that there is an effect of physiotherapy on recovery in Osteoarthritis patients. The study results are supported by a decrease in the average score between the Pre-Treatment Score and Post-Therapeutic score, 33,500, decreasing to 24,000. So it can be concluded that giving physiotherapy is proven to restore the condition of Osteoarthritis patients.

The reduction in pain is due to using the TENS method, where TENS electrical stimulation applied to nerve fibres will produce nerve impulses that travel in two directions along the axon of the nerve in question [26; 27]. This event is known as antidromic activation. The presence of this antidromic impulse will result in the release of P material from sensory neurons, leading to arteriolar vasodilation, which is the basis for the triple response process. The presence of triple responses and suppression of sympathetic activation will increase blood flow so that the transport of materials that affect pain will also increase. TENS is also used to reduce pain through the mechanism of inhibiting the transmission of pain to the brain (gate control theory) and the mechanism of releasing endorphins (a hormone in the brain that reduces pain sensitivity and affects emotions [28; 29]. TENS, which uses a low-voltage electric current, will block sensory nerves to reduce pain and stimulate motor nerves because these electrical impulses resemble brain nerve impulses to stimulate muscle movement. Therefore this therapy can also be used to improve muscle weakness.

Conclusion

There is a relationship between physiotherapy and pain reduction in early osteoarthritis patients. There is a significant difference in the number of osteoarthritis patients between men and women. The number of female patients is more than that of men. Therefore, it is necessary to pay attention to the factors that affect reducing pain in early osteoarthritis patients. Further research is needed to determine which types of physiotherapy are more effective in reducing pain in early osteoarthritis.

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