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An overview of knee osteoarthritis severity in Pandanwangi, Malang

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ABSTRACT

Introduction: The global prevalence of knee osteoarthritis in older adults is expected to continue to increase until 2050. This increase was consistent with the prevalence rates in Malang. Sustainable Development Goals simultaneously control this progression. This service is a measure to support the government in detecting severity early and educating knee osteoarthritis patients.
Methods: The method was adopted through Community-Based Participatory Research at Puskesmas Pandanwangi, Malang. The respondents included 58 elderly people with symptoms of knee osteoarthritis. According to the Indonesian Rheumatology Association, the symptoms often experienced in Indonesia are pain, crepitus when moved, joint stiffness for more than 30 min, indications of enlargement of the knee area, tenderness of the bone edge, and no warmth in the synovium area.
Results: The results of the average mapping show that respondents experienced knee osteoarthritis severity in the mild category or had a Laquesne index score of more than 1-4.
Conclusion: The severity of osteoarthritis in Pandanwangi is influenced by age and body mass index. These respondents were educated on sitting up and down, stair step-up, knee flexion, heel slide knee extension, and tight booster exercises to prevent severity at the next level. Exercise parameters were adjusted according to the respondent's condition for 8-12 weeks, 2-3 sessions per week.

Keywords: Community Health Center; elderly; index lequesne; knee osteoarthritis; non-pharmacological.
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INTRODUCTION

The phenomenon of osteoarthritis (OA) generally occurs in middle-aged to elderly.[1] The elderly population was categorized into older adults aged 65-74 years. The age of 75 and 84 years is the middle age, and those older than 85 years are the oldest elderly.[2] In advanced stages, osteoarthritis can cause joint contractures, muscular atrophy, limb abnormalities, joint discomfort, and dysfunction. Osteoarthritis is a degenerative joint disease caused by the loss of articular cartilage, followed by cartilage repair mechanisms, subchondral bone remodeling, sclerosis, and osteophyte formation.[3]

The Global Burden of Disease shows that the prevalence of osteoarthritis will reach 595 million by 2020. Since 1990, there has been an annual increase of 132.2%. This number will continue to peak at 48-78.6% by 2050. This increase was observed in all types of osteoarthritis. There were three cases of osteoarthritis, with the largest projections occurring in the knee, hand, hip, and other regions. Cases in the knee region are more than 50%.[1]

Worldwide, patients with osteoarthritis occur in the age group over 55 years, with a female dominance of 73%.[4] Meanwhile, the prevalence of osteoarthritis in Indonesia is 70% in the age group of 65–75 years. However, OA is more prevalent in men (15.5%) than in women (12.7%).[5] The prevalence of osteoarthritis severity was determined using the Western Ontario and McMaster University Arthritis Index (WOMAC). The scoring results from both were calculated for years lived with disability (YLD). The global YLD percentage in 2020 was 9.5%, but the percentage in Southeast Asia was much higher, at 19.9%.[1]

Disability caused by osteoarthritis leads to decreased ability in daily activities, work, and participation in aspects of life and independence throughout the life cycle. This condition is categorized as a non-communicable disease (NCD). It is a complex combination of genetic, physiological, behavioral, and environmental factors. All age groups have the potential to suffer from NCD. However, the highest potential was observed in the vulnerable age group. This impact is the focus of the world's Sustainable Development Goals (SDGs). The agenda was derived to the national level until 2030 to reduce the prevalence of NCD in SDGs target 3.4.[6]

The National Bureau of Statistics reports that Malang City in 2023 is categorized as having a life expectancy of 74.13%. This figure has increased yearly, although it is only 0.30%. This percentage is in line with the growth of the elderly population in

Malang City, which is expected to reach 11.04% by 2020. Life expectancy is the main parameter for the government to evaluate health status. The low percentage in Malang City compared to the Special Region of Yogyakarta, Central Java, and East Kalimantan must be accompanied by the development of health development programs.[6,7] The health profile of Malang City in 2020 showed that the Pandanwangi Community Health Center provides elderly health services to 9.518 people. The total number of outpatient visits was 20.433. Most of these visits were for signs of osteoarthritis.[7] The high number of symptoms is due to both local and systemic factors. Local factors include occupation, physical activity, joint injury, limb-length inequality, somatosensory function, joint shape, bone characteristics, anatomical alignment, and dysfunction. Systemic factors include age, sex, ethnicity, genetics, obesity, nutrition, and other diseases. Both of these factors cause osteoarthritis. However, it is progressively able to develop advanced osteoarthritis until it becomes disabled. The level of disability will be reached if there is a degree of severity in age, pain intensity, obesity, strength, comorbidity, and physical activity.[8] This service aims to map the severity of osteoarthritis in patients in Pandanwangi as an early detection effort to support the National SDGs.[9]

METHOD

This service is based on Community-Based Participatory Research (CBPR).[10] The main functions of this method are knowledge production, community mobilization, and knowledge mobilization. The three functions accommodate the academic function in its usefulness in the community. This approach involves partners and academics in research or services, active partners in the activity process, and mutual benefits. The service was conducted at the Pandanwangi Community Health Center in Jl. Laksda Adi Sucipto No.315, Pandanwangi, Kec. Blimbing, Malang City, East Java 65126 between September and December 2023. The service obtained permission from the Health Office of the Malang City Government Number:400/295b/35.73.402.012/2023. Fifty-eight participants were determined using purposive sampling with the criteria of age > 60 years and symptoms of knee osteoarthritis (KOA).[11]

The service implementation adopted the CBPR stages, which consisted of four stages. First, we lay the foundations for determining stakeholders, involvement roles and identifying service concepts. Second, organizing planning systematically, effectively, and efficiently. This preparation aims for the affordability of service implementation. Third, we gathered and analyzed all the findings from the service. Finally, acting on the findings is different from that of research management. This stage aims to follow up on the findings of the service as an effort to transform respondents or partners.[10,11]

This service aims to determine the severity of musculoskeletal disorders that are specific to knee osteoarthritis. The severity of knee osteoarthritis is an assessment that is used to consider effective therapy. The assessment in this service uses the Lequesne index, which is divided into the categories of pain or discomfort, maximum distance walked, and activities of daily living. Each category parameter had a minimum value of 0 and a maximum of 8. However, it is generally interpreted as the degree of severity, which includes normal (0), mild (1-4), moderate (5-7), severe (8-10), very severe (11-13), and extremely severe or almost unbearable (≥14). The index had a concordance value with the radiology results, reaching a kappa value of 0.80. This value indicates the ability of the Lequesne index to be used as a predictor.[12,13]

RESULT

58 respondents in this service came from Pandanwangi Community Health Center. The respondents were dominated by 49 females and nine males, as shown in Table 1. The age of respondents in this service is, on average, 67 years old (y. o.) with a BMI value of 28. This percentage shows that the elderly people in Pandanwangi are overweight. This incident occurs in both elderly females and males.

Anamnesis shows that most respondents (90 %) did not conduct comprehensive KOA examinations and treatments (Table 2). The respondents did not receive non-pharmacological therapy or a combination of pharmacological and non-pharmacological therapies. Thus, all respondents had complaints that referred to the KOA. These complaints include knee pain that occurs gradually and progressively based on the level of functional activity or gradual onset, stiffness, swelling, pain after prolonged rest, and crepitus sounds while moving. The diagnosis in this service does not refer to imaging results. Instead, it uses the respondent's medical records, which are reconfirmed through specific tests. The specific examination consists of several examinations, namely, the bulge sign,[14] patellar tap test,[15] crepitus test[16], as shown in Figure 2a.

Respondents with positive responses to specific examinations were screened for the severity of KOA. The examination used a comprehensive assessment based on the clinical findings of pain, distance walked,

Table 1. Characteristics of respondents

Characteristics	Frequency (n)	Percentage (%)
Respondent	58	100
Gender		
Male	9	16
Female	49	84
Age		
Mature (51 – 64 y.o)	19	33
Young-old (65 – 74 y.o)	33	57
Middle-old (75 – 84 y.o)	6	10
Body Mass Index		
Underweight (≤ 18.4)	3	5
Healthy weight (18.5 – 24)	21	36
Overweight (25 – 29)	22	38
Obesity class 1 (30 – 34)	6	11
Obesity class 2 (35 – 39)	6	10

Table 2. Pharmacotherapy history

History	Frequency (n)	Percentage (%)
Intraarticular hyaluronic acid injection	6	10
Nonsteroidal anti-inflammatory drugs oral	52	90

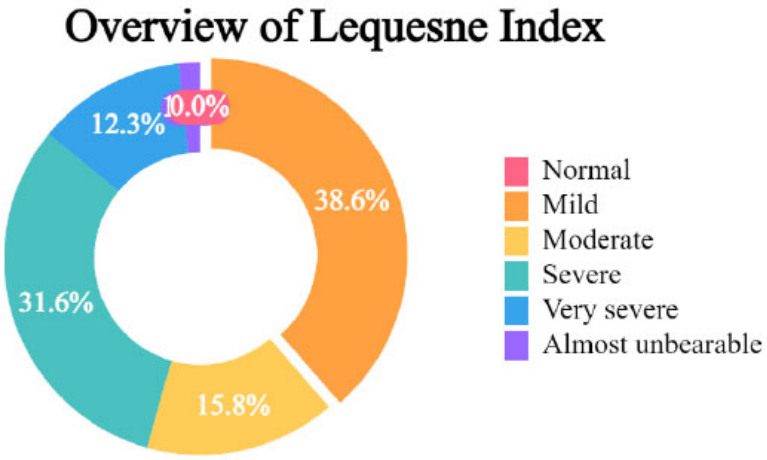

Figure 1. Lequesne index overview.

(a) (b)

Figure 2. The process of service activities. (a) KOA's assessment and specific examination. (b) KOA's severity education and control.

and activities of daily living. The clinical findings consisted of 43 parameters, with a total assessment range of the Lequesne index of 0-24. Upon examination of pain at night, getting up, standing, walking, and getting up from a seat on average, respondents showed pain when moving. Then, the average walking ability could walk 300 m within 15 min. However, the ability to perform daily activities such as up and down stairs, squatting, and walking on uneven surfaces can be very difficult.[5] the examination showed that the average respondent experienced KOA with a mild severity or a value of 2 (Figure 1).

Lequesne index mapping shows that the elderly at the Pandanwangi Community Health Center suffer from KOA of mild severity. The percentage shows normal 0.0%, mild 38%, moderate 15.8%, severe 31.6%, very severe 12.3%, and extremely severe or almost unbearable 1.8%. The severity levels were 0, 22, 9, 18, 7, and 1. Specific examinations revealed positive results for each respondent. However, only a few respondents reported knee swelling. KOA is a progressive, degenerative joint disease. The severity is influenced by physiological factors. There was a linear relationship between KOA severity and age. However, this phenomenon can be inhibited by a combination of pharmacological and nonpharmacological therapies.[17] Non-pharmacological therapy in this service is the last stage or acting on finding.[10]

Aquatic or land-based exercise programs have a positive effect on pain reduction and strength improvement. The program is recommended to be carried out comprehensively for 8-12 weeks, with 2-3 sessions per week for 1 h/per session. This education was delivered through leaflets, and examples of movements are shown in Figure 2b. Education included a presentation of the definition of KOA, risk factors, signs and symptoms, and exercises. The risk factors include age, excessive physical activity, obesity, trauma, and anatomical structural abnormalities. The signs and symptoms of KOA include pain when moving, stiffness, a popping sound when moving, genu valrum or valgum foot structure, and swelling. The movements given as a form of rehabilitation are sitting up and down, stair step ups, knee flexion, heel slide knee extension, and tight boosters.[18]

DISCUSSION

Knee osteoarthritis (KOA) is an inflammation that affects the activities of daily living. The incidence of KOA is most often progressive chronic inflammation. Although age is the population that suffers the most from KOA, it is no longer considered a degenerative disease. This assumption is based on the unspecified etiology of KOA.[19] This phenomenon is further clarified by the existence of phenotypes, defined as differences in clinical manifestations in the same KOA category. The phenotypes include chronic pain, inflammation, metabolic syndrome in the hard and soft tissues, and mechanical overload. These phenotypes are mostly found in patients with KOA, which is a heterogeneous disease.[20]

Knee osteoarthritis occurs in the cartilage during the articulation of the knee joint. Bone consists of a matrix with a minimal distribution of chondrocytes or a dense extracellular matrix (ECM). This matrix is divided into superficial, middle, and profundus parts. In patients with KOA, chondrocytes and ECM components undergo extensive changes. These changes are due to increased apoptosis and necrosis

caused by metabolic disorders. This disorder inhibits ECM synthesis, which results in increased ECM degradation. This increase is accompanied by the release of the inflammatory factor TNFα by synovial membrane chondrocytes and fibroblasts. The release of TNFα stimulates inflammation of the knee joint. This inflammation causes hyperplasia, synovial fibrosis, chondrocyte hypertrophy, and oxidative stress owing to reactive oxygen species (ROS). ROS events do not occur without a balance between chondrocyte metabolism in the articular tissue.[3]

This service also has the limitation of not conducting periodic evaluations regarding severity after the exercise is given. Thus, it does not distinguish between the severity of unilateral or bilateral knee osteoarthritis. In addition, the severity assessment performed using the Lequesne index in this study only examined symptoms, signs, and conditions that are characteristic of KOA. This index is a prediction that needs to be strengthened by radiographic or laboratory examination to determine the structural and metabolic conditions suspected of KOA.[12] Radiology has a sensitivity of 91% and a specificity of 86%. In contrast, laboratory examinations have a sensitivity of 92% and a specificity of 75%. Clinical manifestations that often appear in KOA are joint pain, crepitus when moved, joint stiffness for more than 30 min, indications of enlargement of the knee area, tenderness of the bone edge, and no warmth in the synovium area. Laboratory examination showed a blood sedimentation rate of less than 40 mm/h and a hematoid factor of less than 1:40. While the radiological picture can be found osteophytes, narrowing of the joint gap, valgus deformity (hallux valgus), ankylosing (hallux rigidus) and misalignment of bone structures. These impressions can be observed in the standing position with full knee support. Radiographic examination is performed by comparing bilaterally, including anteroposteriorly.[3,5]

KOA progression is characterized by the appearance of pathophysiologically induced complicating factors. Narrowing of the knee joint cleft leads to asymmetry. This event can potentially change the anatomical line of the joint, thereby increasing subluxation. A valgus or varus knee pattern characterized this change. Mechanical factors also aggravate KOA.[21] Continuous inflammation results in fragmentation of the joint surface. These fragments are debris in synovial or osteochondral cavities that remain attached to the joint surface. Synovial effusion can develop into Baker's cyst in the popliteal fossa.[8,13]

The severity factors in this service were dominated by age and BMI. Obesity has both systemic and mechanical effects. Obesity in KOA patients has the potential to worsen. This condition is ideal for modifications to reduce the severity of KOA.[9] Previous studies have consistently reported that BMI is a modifiable independent factor. Hyperlipidemia and high-density lipoprotein (HDL) levels can increase KOA symptoms. Patients with obesity are recommended to consume vitamins D, E, and K to reduce the progression of KOA. However, it cannot reduce pain or cartilage loss.[20]

The findings in this service follow the management recommendations of the Indonesian Rheumatology Association (IRA). Management consists of stage I (non-pharmacological therapy) and stage II (pharmacological therapy). This service uses the first-stage approach with the education level category and a low-impact exercise program. Level of evidence category I is a weight-loss program and low-impact aerobic exercise. Level II includes education, self-management programs, physical functional training, and movement protection.[8,13] Low-impact exercise programs are still administered to respondents with a history of intra-articular hyaluronic acid injection or those taking nonsteroidal anti-inflammatory drugs. The National Institute for Health and Care Excellence (NICE) reports that there is no evidence of improved quality of life in patients with KOA who receive long-term injections. However, pain reduction is inconsistent. This requires repeated injection actions within a certain period. It has the potential to cause adverse effects.[22]

CONCLUSION

The Lequesne index effectively shows the severity of knee osteoarthritis in the elderly at the Pandanwangi Community Health Center. The high prevalence of knee osteoarthritis severity indicates the need for further action to control the progression of symptoms. The incident worsened with the respondents' aging condition and high BMI, as well as knowledge about their self-control. Progression can be controlled through an exercise program that has been given. It is recommended that the exercise program be carried out on an ongoing basis to control the severity that has the impact on the respondent's disability or independence.

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CONFLICT OF INTERESTS

This community service has no conflict of interest.

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AUTHOR CONTRIBUTION

	Contributor 1	Contributor 2	Contributor 3	Contributor 4	Contributor 5	Contributor 6	Contributor 7
Concepts	√						
Design	√						
Definition of intellectual content	√						√
Literature search		√			√	√	√
Clinical studies			√	√	√	√	√
Experimental studies			√	√	√	√	√
Data acquisition			√	√			
Data analysis		√					
Statistical analysis		√					
Manuscript preparation	√						√
Manuscript editing	√						
Manuscript review	√						
Guarantor	√						√

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