Original Research

Profile of Age, Gender, and Body Mass Index in Patient with Knee Osteoarthritis in Surabaya

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ABSTRACT

Background: Osteoarthritis is a degenerative disease which attacks all the joint parts, including articular cartilage, subchondral bone, ligament, meniscus, capsule, synovium, and periarticular tissue. Among various joints in human body, knee joint is the most affected by osteoarthritis. There are several established risk factors for knee osteoarthritis, including age, female gender, and obesity.
Aim: This study aimed to describe age, gender, and body mass index (BMI) profile in knee osteoarthritis patients.
Material and methods: This was a retrospective descriptive study with total sampling of 292 medical records of patient with knee osteoarthritis from Physical Medicine and Rehabilitation outpatient clinic, Universitas Airlangga Hospital, Surabaya.
Results: Of all the data, there were 130 medical records included in this study. The majority characteristic of the subjects were older than 60 years old (54.6%), 98 (75.4%) were females and 32 (24.6%) were males. The highest male-female ratio was on 45-59 years old (1:4). Most patients were obese (58.5%) with the highest percentage was on 45-59 years old (51.3%).
Conclusion: The majority of osteoarthritis patients in Universitas Airlangga Hospital Surabaya were elderly, females, and obese people.
Keywords: *age, gender, knee osteoarthritis, BMI*

Introduction

Osteoarthritis is a chronic degenerative joint disease that often occurs in older people. Osteoarthritis attacks all the joint parts, including articular cartilage, subchondral bone, ligament, meniscus, capsule, synovium, and periarticular tissue.[1] WHO data shows that approximately 9.6% of male and 18% of female in the world over 60 years have osteoarthritis. As many as 80% of osteoarthritic patients have limitation of movement, and 25% of patients can not do daily activities.[2] In Indonesia, the prevalence of joint disease based on RISKESDAS 2018 is 7.30%, with the highest prevalence in the elderly (18.63%). The prevalence in females is higher than males (8.46% vs 6.13%). Although the survey does not explain in detail about the incidence of osteoarthritis, osteoarthritis is included in the category of joint disease.[3]

Osteoarthritis can occur in various joints, such as joints in the knee, hand, hip, feet, and spine. From those various joints, the knee joint is mostly affected by osteoarthritis. According to Pallazo *et al.* incidence rates of osteoarthritis is 6.5, 2.1, and 2.4/1000 person- year for knee, hip, and hand respectively.[4,5]

Osteoarthritis is mainly caused by degradation of joint cartilage, but research also showed that combination of cellular changes and biomechanical stress (such as subchondral bone remodeling, osteophytic formation, bone marrow lesions, synovial changes, joint capsules, ligaments, periarticular muscles, and meniscal tears) also contribute to osteoarthritis.[1] The usual symptom is pain in the joints. Pain occurs as a result of a stimulus to the nociceptor nerves located around the location of the joint (subchondral bone, periosteum, synovium, and capsule of the joint). This symptom can also be followed by joint stiffness, swelling, deformity, and limitation of movement.[4]

There are several established risk factors for knee osteoarthritis, such as old age, female gender, and obesity. Age and gender are not modifiable risk factors, meanwhile body mass index (BMI) is a modifiable risk factor.

Along with the relatively high prevalence of knee osteoarthritis, this study aimed to describe age, gender, and body mass index (BMI) profile in the population at Physical Medicine and Rehabilitation outpatient clinic, Universitas Airlangga Hospital, Surabaya.

Material and Methods

This study design was a retrospective descriptive study on medical records of patient with knee osteoarthritis from Physical Medicine and Rehabilitation outpatient clinic, Universitas Airlangga Hospital, Surabaya. The sampling technique of this study was total sampling, by excluding data that did not contain age, gender, and BMI. Overall, there were 292 medical records, and 162 medical records that lacked BMI data were excluded.

The data was analyzed with SPSS Statistics 16.0. Descriptive statistical components, such as percentage, mean, and standard deviation (SD), were used to describe data. This study has obtained approval of ethical clearance from ethics commission of Airlangga University Hospital Surabaya No. 104/KEH/2018.

Results

There were 130 medical records included for this study. The age range of the subjects was between 30-89 years old. Table 1 described characteristic of the subject.

Table 1. Subject Characteristic

Characteristic	Mean (SD) or *n* (%)
Age, mean (SD)	60.35 (9.6)
Gender, *n (%)*	
Male	32 (24.6)
Female	98 (75.4)
BMI, mean (SD)	26.2 (5.16)

All the subjects were grouped according to the classification by Indonesian Ministry of Health. This classification divides age into: adult (19-44 years old), pre-elderly (45-59 years old), and elderly (> 60 years old).[6] The majority age group was elderly (54.6%), followed by pre-elderly (41.5%), and adult (3.9%).

Figure 1 described gender distribution based on age group of patients with knee osteoarthritis. Ratio between male and female knee osteoarthritis patients reached the peak at the group of 45-59 years old (1:4).

The BMI classification used was according to the Asia-Pacific classification which divides BMI into 4 categories: underweight (<18.5), normal (18.5-22.9), overweight (23-24.9), and obese (≥25). Complete distribution of BMI based on gender and age were shown in table 2.

Table 2 showed that the obese population was higher than non-obese (58.5% vs 41.5%). As many as 59.4% male patients and 58.2% female patients were obese. It also showed that there were differences in the age distribution of males and females in obese population. The majority of age in obese females was in pre-elderly age group, while in obese males it was the elderly group. Overall, the majority of age in obese population was in pre- elderly group.

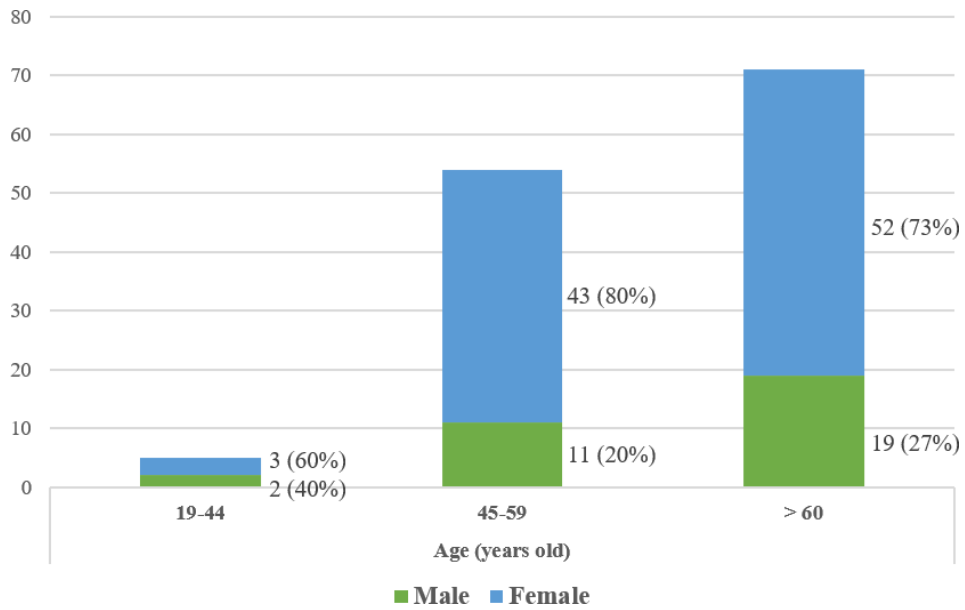

Figure 1. Gender distribution based on age group

Table 2. BMI distribution based on gender and age

Gender	Age (y.o)	Body Mass Index (kg/m^2)				Total
		<18,5	18,5-22,9	23-24,9	≥ 25	
Male	19-44	0	1	0	1	2
	45-49	0	3	0	8	11
	> 60	1	3	5	10	19
Female	19-44	0	0	0	3	3
	45-49	5	3	4	31	43
	> 60	6	11	12	23	52

Total	19-44	0	1	0	4	5
	45-49	5	6	4	39	54
	> 60	7	14	17	33	71
Total		12 (9,3%)	21 (16,1%)	21 (16,1%)	76 (58,5%)	130 (100%)

Discussion

The patient's characteristics were dominated by the elderly (over 60 years), as many as 71 patients (54.6%), and females, as many as 98 patients (75.4%). This is in accordance with the theory which has been stated that the prevalence of knee osteoarthritis is greater in the elderly and females. Research conducted at the Physical Medicine and Rehabilitation Installation RSUP Prof. Dr. R.D. Kandou Manado in January - June 2017 also showed that knee osteoarthritis patients' characteristic was dominated by elderly (66.7%), and female (70.4%).[7]

Silverwood *et al.* had summarized 11 cohort studies which showed that females have greater risk factors for osteoarthritis.[8] There are anatomical and hormonal differences between males and females which were related to the volume of the knee cartilage. Hanna *et al.* said that males have a greater total volume of tibia and patella cartilage than females. In addition, females have tendency to have defect at the base of the patella cartilage. However, more research is needed to confirm this theory. Hormone that plays a role in knee osteoarthritis incidence is estrogen which has a protective function for cartilage. The incidence of knee osteoarthritis in females is increased after menopause because of the depletion on estrogen level. This condition makes older females are more at risk than young females.[9]

As the person ages, the cell and its extracellular matrix are also getting older. Basically, osteoarthritis occurs because of an imbalance in the anabolism and catabolism process in joint, and the cell aging contributes to this state. Aging chondrocytes have a poor response from stimulation of growth factors, so that homeostasis in articular cartilage is disrupted. In addition, aging chondrocytes is also more susceptible to cell death, so that the cartilage cannot be regenerated properly.[10]

Ratio of male and female patients reached the peak in the pre-elderly group (1:4), followed by elderly group (1 : 2.7), and adults group (1 : 1.5). This could happen due to other risk factors such as obesity, because the prevalence of obese females in the 45-59 years group was higher than obese males, with 54.4% and 42.1%, respectively.

Majority of the patients had $\geq$ 25 kg/m^2 Body Mass Index, led by the obese group (58.5%), followed by overweight and normal groups (16.1% people for each group), and underweight groups (9.3%). This was consistent with the theory that obesity is a risk factor for knee osteoarthritis.[11] The research conducted at the Internal Medicine Installation and Orthopedic & Traumatology Installation at Dr. Soetomo General Academic Hospital in September - October 2016 also showed similar results which showed that majority of knee osteoarthritis patients were obese.[12] Obesity induces several pathways that predispose an individual to knee osteoarthritis. Obesity causes abnormal joint loads that lead to the change of composition and properties of articular cartilage. When body weight is increased, the muscle mass and fat mass are also increase, but the volume of muscle mass is still relatively low causing it to be inadequate to bear the load upon. To compensate, obese people usually change the gait patterns and have aberrant biomechanics. This thing could cause joint degeneration that leads to osteoarthritis.[13]

Another pathway is through an abnormal activation of the neuroendocrine and pro-inflammatory pathways that change the control of the food intake, fat expansion, and metabolic status. Active white fat tissue increases the synthesis of pro-inflammatory cytokines such as IL-6, IL-1, IL-8, TNF-α, but decreases regulatory cytokines such as IL-10. This shows the relationship between obesity and osteoarthritis. Obesity genes and their products, leptin, have an important role in the development of osteoarthritis.[14]

Nineteen over 32 male patients (59.4%). and 57 over 98 female patients (58.2%) of this study were obese. In the male group, majority of obesity was found in elderly, while in female group it was found in 45-49 years old. Table 2 shows that the highest incidence of knee osteoarthritis in females was in elderly group (> 60 years old) with the most BMI was obesity. However, when compared to the all-female obese group, it turned out that the prevalence of knee osteoarthritis at pre-elderly group (45-59 years old) was much higher. It is in accordance with research data conducted by Sofa which shows that as females ages, the BMI will also decrease.[15] This may occur in aging process as the muscle mass will decrease, so that the body weight will also decrease.[15] As previously stated, low muscle mass could also lead to osteoarthritis. However, this result couldn't be confirmed because there were no definitive body composition measurements in this study.

The limitation of this study was the use of secondary data, so there was no complete description of all patients due to incomplete data. This study is also unable to describe the correlation between these risk factors and incidence of knee osteoarthritis, because there was no comparison group.

Conclusion

The majority of osteoarthritis patients in Universitas Airlangga Hospital Surabaya are elderly, females, and people with a BMI $\geq$ 25 (obesity).

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References

1. Man GS, Mologhianu G. Osteoarthritis pathogenesis - a complex process that involves the entire joint. *J Med Life*. 2014;7(1):37–41. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3956093/
2. WHO. Chronic rheumatic conditions [Internet]. World Health Organization; 2016 [cited 2017 Jun 1]. Available from: http://www.who.int/chp/topics/rheumatic/en/
3. Kementrian Kesehatan RI. Laporan Nasional RISKESDAS 2018. Jakarta: Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan; 2019. Available from: http://labdata.litbang.kemkes.go.id/images/download/laporan/RKD/2018/Laporan_Nasional_ RKD2018_FINAL.pdf
4. Blom A, Warwick D, Whitehouse M. Apley and Solomon's System of Orthopaedics and Trauma. 10th ed. Boca Raton: CRC Press; 2018. p.91-105.
5. Palazzo C, Nguyen C, Lefevre-Colau M, Rannou F, Poiraudeau S. Risk factors and burden of osteoarthritis. *Annals of Physical and Rehabilitation Medicine*. 2016;59(3):134-138. Available from: doi: 10.1016/j.rehab.2016.01.006
6. Peraturan Menteri Kesehatan Republik Indonesia No. 25, 2016.
7. Soeryadi A, Gessal J, Sengkey LS. gambaran faktor risiko penderita osteoartritis lutut di instalasi rehabilitasi medik RSUP Prof . Dr . R . D. Kandou Manado periode Januari –Juni 2017. 2017;23. Available from: doi: 10.35790/ecl.5.2.2017.18540
8. Silverwood V, Jinks C, Jordan JL, Protheroe J, Jordan KP. Current evidence on risk factors for knee osteoarthritis in older adults: A systematic review and meta-analysis. *Osteoarthr Cartil.* 2015;23(4):507–15. Available from: doi: 10.1016/j.joca.2014.11.019\
9. Hame SL, Alexander RA. Knee osteoarthritis in women. *Curr Rev Musculoskelet Med*. 2013;6(2):182–7. Available from: doi: 10.1007/s12178-013-9164-0
10. Krajewska-Włodarczyk M. Owczarczyk-Saczonek A. Placek W. Osowski A. Wojtkiewicz J.

Articular cartilage aging-potential regenerative capacities of cell manipulation and stem cell therapy. *International Journal of Molecular Sciences*. 2018;19(2):623. Available from: 10.3390/ijms19020623

11. Heidari B. Knee osteoarthritis prevalence, risk factors, pathogenesis and features: part I. *Casp J Intern Med*. 2011;2(2):205–12. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3766936/

12. Ahmad IW, Rahmawati LD, Wardhana TH. Demographic profile, clinical and analysis of osteoarthritis patients in Surabaya. 2018;01(01):34–9. Available from: https://e-journal.unair.ac.id/BHSJ/article/view/8208/4927.

13. Vincent H, Heywood K, Connelly J, Hurley R. Obesity and weight loss in the treatment and prevention of osteoarthritis. *PM&R*. 2012;4:S59-S67. Available at: doi: 10.1016/j.pmrj.2012.01.005

14. Gaddey HL, Holder K. Unintentional weight loss in older adults. *Am. Fam. Physician.* 2014;89:718–722.

15. Sofa I. Kejadian obesitas, obesitas sentral, dan kelebihan lemak viseral pada lansia wanita. *Amerta Nutrition*. 2018;2(3):228-236. Available at: https://ejournal.unair.ac.id/AMNT/article/view/8788