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Original Article

Burden of osteoarthritis in Indonesia: A Global Burden of Disease (GBD) study 2019

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Abstract

Osteoarthritis (OA) is a complex and common condition, especially affecting the knees due to their weight-bearing role. Traditionally seen as a degenerative disease, OA is now understood to have both mechanical and inflammatory causes. Despite its increasing prevalence, there is limited data on OA in Indonesia, resulting in low awareness among clinicians and the public. The aim of this study was to describe the OA burden in Indonesia, focusing on its prevalence, incidence, and years lived with disability (YLD) from 1990 to 2019, using data from the Global Burden of Disease (GBD) study 2019. A descriptive cross-sectional study was conducted to examine the prevalence, incidence, and YLD of OA in Indonesia from the GBD study 2019. OA prevalence and YLD were compared to other countries according to similar social demographics and geographical proximity. OA YLD was also compared to the top causes of death and disability YLD in Indonesia. The study found that OA cases in Indonesia more than doubled from 1990 to 2019, with increases of 153.12% in males and 143.36% in females. Similar trends were observed for knee OA. The age-standardized prevalence rate in Indonesia increased by 11.03% in males and 8.42% in females, and these were higher compared to China, India, Singapore, and the global average. Younger people had a higher OA prevalence rate growth than older groups. The incidence rate for OA also rose significantly, with males seeing a 10.89% increase to 290 per 100,000 people and females with an 8.57% increase to 384 per 100,000 people. Despite lower overall burden rates compared to some countries, Indonesia experienced significant growth in YLD due to OA (12.16% in males and 9.65% in females) since 1990. Although OA was less burdensome than stroke, diabetes, low back pain, and chronic obstructive pulmonary disease (COPD), its YLD growth rate was higher. In conclusion, OA prevalence and incidence in Indonesia significantly increased from 1990 to 2019, with a notable rise among younger populations. OA had a higher YLD growth compared to several other major diseases in Indonesia, highlighting the need for early detection and preventive measures, particularly for the younger population.

Keywords: Osteoarthritis, Indonesia, epidemiology, prevalence, years lived with disease

Introduction

Osteoarthritis (OA) is not only one disease entity but a compilation of pathology of cartilage loss, bone spur formation, and bone remodeling [1,2]. It is one of the most common problems in the musculoskeletal system affecting 32.5 million people, which accounts for 1 in every 7 adults in the United States having OA [3]. Globally, OA has shown a 113.25% prevalence increase from 247.51 million cases in 1990 to 527.81 million cases in 2019 [4].

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OA is a leading cause of joint pain, swelling, and stiffness that causes individual quality of life deterioration. All joints can be affected by OA, but the most prevalent joint affected is the knee, as it is a weight-bearing joint [5]. In 2020, the global prevalence of knee OA was 16% (95%CI: 14.3–17.8%) [6]. Although OA used to be considered a degenerative wear and tear disease, recently, it has been recognized that cases of OA in younger people are rising [7]. The cause of OA affecting younger people is related to OA pathophysiology, which is believed to have a multifactorial origin with both mechanical and inflammation interplay in developing OA, replacing the theory that OA is only caused by mechanical injury [7]. Modifiable risk factors for developing OA include being overweight, injury, and overuse of knee bending or squatting [8]. Overweight and metabolic syndrome could induce low-grade inflammation, which promotes joint pain and increases synovial inflammation, which in turn progresses OA and induces chondrocyte intrinsic catabolic response [8]. The rising rate of injuries and obesity in younger people alerts clinicians of the possible surge of OA in younger people in the near future [8]. Therefore, up-to-date information about OA epidemiology is needed to enlighten clinicians about the burden of OA and target the prevention of OA.

In Indonesia, OA data, including the prevalence, incidence, and years lived with disability (YLD) is still scarce. The prevalence of OA diagnosed based on radiographic images was 12.7% in women and 15.5% in men in 2006 [9]. Newer studies of OA epidemiology in Indonesia have not been published. The lack of data and epidemiology studies on OA causes clinicians to neglect OA. The health service providers and the general public are still unaware of the increasing rate of OA prevalence, especially in younger people, and the possibility of preventing OA. Younger people in this context are defined as people younger than 50 years old [10,11]. The Global Burden Disease (GBD) study allows us to analyze the burden of 369 injuries and diseases, including OA, in 204 countries. The aim of this study was to determine the prevalence, incidence, YLD, and the changing trend of OA in Indonesia using the data from the 2019 GBD study.

Methods

Study design and data source

A descriptive cross-sectional study was conducted using data from the GBD study 2019 in Indonesia, which is available at https://vizhub.healthdata.org/gbd-results/. The GBD study used multiple data sources from household surveys, censuses, civil registration and vital statistics, health service use, disease registries, and many other sources. GBD reported uncertainty intervals (UI) around the point estimation, which were taken from the 25th and 97.5th percentile values using the bootstrapping method. GBD 2019 provides up-to-date descriptive epidemiology data of diseases and injuries from 204 countries and territories from 1990 to 2019 [10-12]. Osteoarthritis included in GBD estimation was defined in the International Classification of Diseases, Tenth Revision (ICD-10) code M16-19 or ICD-9 code 715-715.98, 731-731.9. Knee osteoarthritis was defined in the ICD-10 code M17-17.9. A dataset was estimated based on prior research (**Underlying data**) [11]. OA data used in this study were shown in rate and number of which rate data were reported as per 100,000 people. Graphs and tables were displayed to summarize the results of this study.

Data analysis

Prevalence, incidence, and YLD from 1990 to 2019 data were analyzed descriptively to acknowledge sex-specific OA burden. Knee OA was also highlighted in this study because knee OA is still the most prevalent case of OA in Indonesia. Data for overall OA cases and knee OA was examined to compare the role of knee OA burden compared to OA in general. Age-standardized YLD rates of OA were compared descriptively to stroke, ischemic heart disease, diabetes, low back pain, and chronic obstructive pulmonary disease (COPD) as among the top 10 diseases that cause death and disability in Indonesia [13]. The age-standardized prevalence rate and YLD rate of Indonesia were compared to China, India, Malaysia, and Singapore, as well as to the global level. Those countries were chosen based on similar social demographic profiles or geographic proximity. The growths or changes of the OA prevalence, incidence, and YLD from 1990 to 2019 were analyzed using a simple method as the prevalence/incidence/YLD value from 2019 was

deducted by the prevalence/incidence/YLD value from 1990 and divided with the prevalence/incidence/YLD value from 1990 then multiplied with 100%.

Results

Sex-specific osteoarthritis number in Indonesia

Of the estimated 259,465,836 population of Indonesia in 2019 (**Underlying data**), around 5.5 million females and 4.1 million males had osteoarthritis (**Table 1**). The number of OA cases in 2019 increased by 153.12% in the male population and 143.36% in the female population compared to 1990. OA cases more than doubled in 2019 compared to 1990 in both sexes. Overall, rising cases of OA in Indonesia were in concordance with global population OA growth; rather, Indonesia had a higher rate of OA cases growth. Indonesia had a total of 147.44% increase compared to the global population with a 113.25% increase from 1990 to 2019 (**Table 1**).

Table 1. Sex-specific osteoarthritis number of cases in Indonesia compared to global level, 1990 and 2019

Country	Cause of disability	All ages prevalent cases (uncertainty interval)		Change from 1990
		1990	2019	
Indonesia	Osteoarthritis			
	Males	1,629,551 (1,431,893–1,839,465)	4,124,773 (3,634,801–4,632,179)	+153.12%
	Females	2,273,457 (2,009,898–2,560,117)	5,532,699 (4,905,508–6,214,272)	+143.36%
	Both sexes	3,903,008 (3,437,412–4,392,469)	9,657,472 (8,535,699–10,832,641)	+147.44%
	Knee osteoarthritis			
	Males	1,215,246 (1,033,384–1,409,917)	3,106,509 (2,639,897–3,619,494)	+155.63%
	Females	1,892,644 (1,619,920–2,189,976)	4,676,333 (3,992,880–5,436,913)	+147.08%
	Both sexes	3,107,890 (2,654,526–3,604,253)	7,782,842 (6,639,675–9,048,391)	+150.42%
Global	Osteoarthritis			
	Males	96,984,436 (87,374,934–108,263,346)	210,370,673 (190,199,616–233,664,997)	+116.91%
	Females	150,529,094 (136,507,084–166,896,513)	317,441,198 (288,484,946–350,274,615)	+110.88%
	Both sexes	247,513,530 (224,046,170–275,496,989)	527,811,871 (478,667,549–584,793,491)	+113.25%

Among the 9,657,472 OA cases estimated in 2019 in Indonesia, 7,782,842 were knee OA cases, consisting of 3,106,509 males and 4,676,333 females (**Table 1**). There was an estimated 155.63% increase in the male population and 147.08% increase in the female population for knee osteoarthritis cases in 2019 compared to 1990. Knee osteoarthritis cases in Indonesia were also more than doubled in 2019 compared to 1990.

Sex-specific age-standardized prevalence of osteoarthritis in Indonesia compared to other countries

The sex-specific age-standardized prevalence rate of OA is presented in **Table 2**. Among Indonesian female population, the prevalence rate of OA increased significantly from 1990 to 2019. OA prevalence rate among the Indonesian female population was 4,582 per 100,000 people in 2019, which increased by 8.42% from 1990, with a prevalence rate of 4,226 per 100,000 people. Although the OA prevalence rate among the Indonesian male population was not as high as the female population, their growth was higher than females between 1990 and 2019 (from 3,245 to 3603 per 100,000 with an 11.03% increase). Compared to several other countries in Asia and the global rate, the OA prevalence rate was similar to Malaysia but less prevalent than in other countries, including China, India, Singapore, and the global rate. Nevertheless, the prevalence rate growth was more prominent in Indonesia than in China, India, Singapore, and globally.

Table 2. Sex-specific osteoarthritis age-standardized prevalence rate per 100,000 people in Indonesia and globally

Country	Cause of disability	Age-standardized prevalence rate (uncertainty interval)		Change from 1990
		1990	2019	
Indonesia	Osteoarthritis			
	Males	3,245 (2,874–3,622)	3,603 (3,209–4,012)	+11.03%
	Females	4,226 (3,757–4,729)	4,582 (4,089–5,116)	+8.42%
	Knee osteoarthritis			
	Males	2,365 (2,018–2,737)	2,654 (2,274–3,062)	+12.22%
	Females	3,472 (2,983–4,004)	3,832 (3,300–4,424)	+10.37%
China	Osteoarthritis			
	Males	4,845 (4,325–5,419)	5,245 (4,680–5,900)	+8.26%
	Females	6,889 (6,151–7,714)	7,366 (6,571–8,254)	+6.93%
	Knee osteoarthritis			
	Males	3,522 (3,009–4,059)	3,744 (3,183–4,348)	+6.30%
	Females	6,017 (5,163–6,955)	6,431 (5,514–7,424)	+6.88%
Malaysia	Osteoarthritis			
	Males	3,348 (2,953–3,755)	3,763 (3,325–4,217)	+12.40%
	Females	4,483 (3,978–5,022)	4,997 (4,446–5,609)	+11.46%
	Knee osteoarthritis			
	Males	2,484 (2,104–2,898)	2,808 (2,404–3,295)	+13.04%
	Females	3,756 (3,209–4,357)	4,252 (3,631–4,925)	+13.19%
India	Osteoarthritis			
	Males	4,144 (3,722–4,603)	4,487 (4,039–4,969)	+8.28%
	Females	5,710 (5,150–6,362)	6,113 (5,518–6,800)	+7.06%
	Knee osteoarthritis			
	Males	2,968 (2,562–3,418)	3,259 (2,814–3,754)	+9.80%
	Females	4,257 (3,682–4,888)	4,658 (4,024–5,338)	+9.42%
Singapore	Osteoarthritis			
	Males	5,398 (4,837–5,971)	5,765 (5,194–6,386)	+6.80%
	Females	11,076 (9,949–12,422)	11,408 (10,253–12,762)	+2.99%
	Knee osteoarthritis			
	Males	3,977 (3,391–4,580)	4,293 (3,682–4,946)	+7.95%
	Females	6,982 (5,995–7,982)	7,373 (6,404–8,437)	+5.60%
Global	Osteoarthritis			
	Males	5,138 (4,656–5,713)	5,324 (4,827–5,885)	+3.62%
	Females	7,082 (6,425–7,851)	7,278 (6,614–8,039)	+2.77%
	Knee osteoarthritis			
	Males	3,280 (2,829–3,770)	3,510 (3,033–4,037)	+7.01%
	Females	4,762 (4,122–5,436)	5,161 (4,471–5,890)	+8.38%

The prevalence of knee OA among the Indonesian female population was 3,472 per 100,000 people in 1990 and increased by 10.37% to 3,832 per 100,000 people (**Table 2**). Whereas the prevalence rate for knee OA among the male population was 2,365 per 100,000 people in 1990 and increased 12.22% to 2,654 per 100,000 people in 2019. Similar to the overall OA rate, the knee OA prevalence rate in Indonesia was similar to Malaysia and less prevalent than in China, Singapore, India, and the global rate (**Table 2**). When examining the change or growth in the prevalence rate of knee OA, it was more prominent in Indonesia than in China, India, Singapore, and globally.

Prevalence rate of OA in Indonesia, by age and sex

The OA prevalence rate from 1990 to 2019 in the Indonesian female and male population is presented in **Figure 1**, while the prevalence rate changes are presented in **Figure 2**. The data indicated that the prevalence rate of OA increased with aging either among the female or male populations. There was an increase in OA prevalence rate in the group of 30–34 years old (15.69% in the female population and 14.58% male population) but it had a decline trend for all other age groups, with the age group of ≥95 years old had the lowest OA growth (4.84% in female and 6.21% in male population) as illustrated in **Figure 2**. Although age was a major factor in the higher OA prevalence rate, the OA rate from 1990 to 2019 in the same age group increased and the younger group had a significantly higher prevalence rate growth than the older population (**Figure 2**).

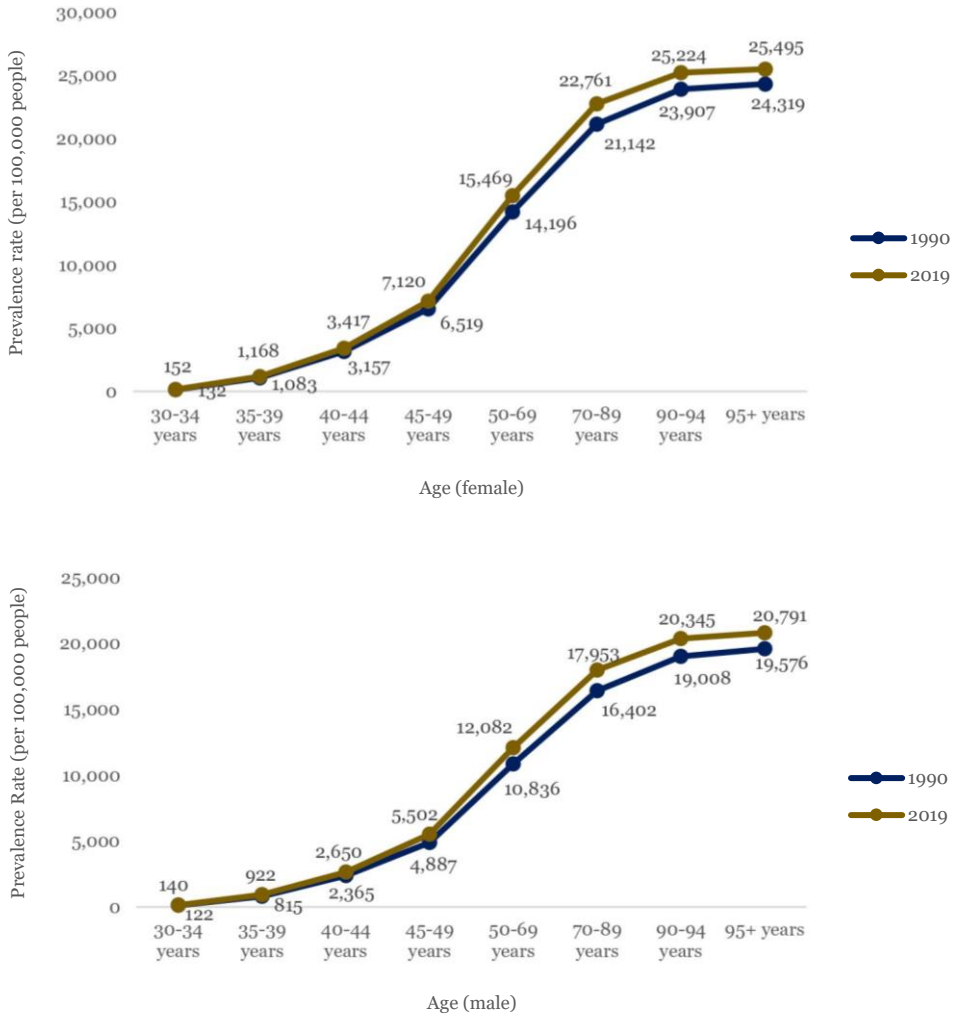

Figure 1. Prevalence rate of osteoarthritis in Indonesian female and male population per 100,000 people, 1990–2019.

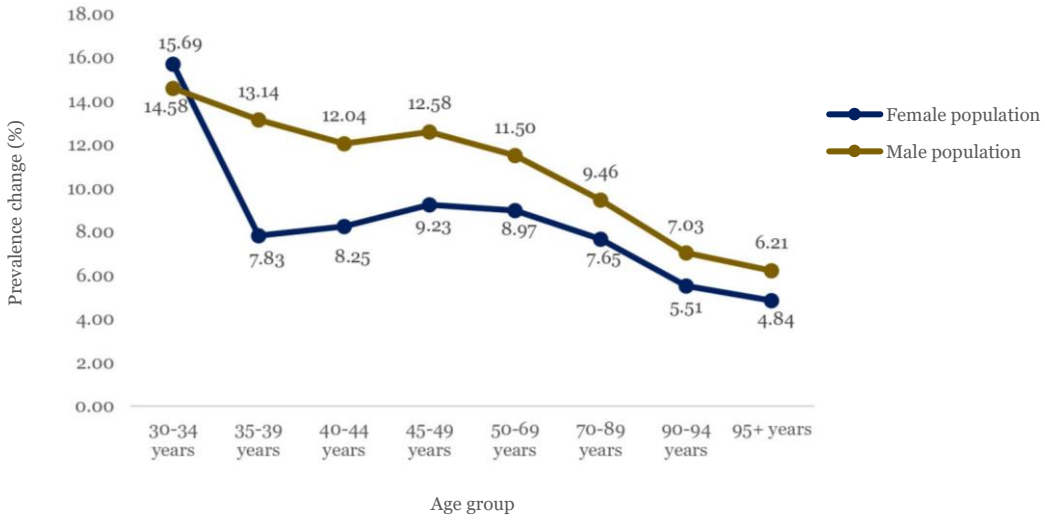

Figure 3. The changes in prevalence rate of osteoarthritis in Indonesian male and female population, 1990–2019.

Sex-specific incidence of osteoarthritis in Indonesia

The Indonesian sex-specific age-standardized incidence rate for OA increased significantly from 1990 to 2019, as presented in **Table 3**. The incidence rate for OA among Indonesian males was

261 per 100,000 people in 1990, increased 10.89% to 290 per 100,000 people in 2019. Meanwhile, the Indonesian female population incidence rate for OA increased by 8.57% to 384 per 100,000 people in 2019 from 354 per 100,000 people in 1990.

Table 3. Sex-specific osteoarthritis age-standardized incidence rate (per 100,000 people) in Indonesia in 1990 and 2019

Cause of disability	Age-standardized incidence rate (uncertainty interval)		Change from 1990
	1990	2019	
Osteoarthritis			
Males	261 (231–290)	290 (257–322)	+10.89%
Females	354 (314–395)	384 (340–430)	+8.57%
Knee osteoarthritis			
Males	201 (174–231)	224 (194–257)	+11.44%
Females	293(253–335)	321 (278–366)	+9.54%

Out of 290 cases per 100,000 male population OA incidence and 384 cases per 100,000 female population incidences in 2019, knee OA was attributed to 77–84% OA incidence rate with the incidence rate of 224 cases per 100,000 male population and 321 cases per 100,000 female population having knee OA. Knee OA specifically had an incidence rate of 201 per 100,000 people among Indonesian males in 1990, which increased by 11.44% to 224 per 100,000 people in 2019. The incidence rate for knee OA among Indonesian females increased by 9.54% from 293 per 100,000 to 321 per 100,000 people from 1990 to 2019.

Years lived with disability (YLDs) osteoarthritis in Indonesia and globally

Years lived with disability caused by OA and knee OA of the Indonesian population have shown a significant change from 1990. Indonesian OA and knee OA YLD in males and females all doubled in a period of a decade from 1990–2019 (**Table 4**). Compared to several other countries, Indonesian OA and knee OA were estimated to be less burdening than China, India, Malaysia, Singapore, and the global rate, but the increasing rate of YLD was higher than the global and other countries except for Malaysia (**Table 5**).

Table 4. Sex-specific osteoarthritis and knee osteoarthritis years lived with disability number in 1990 and 2019

Cause of disability	All ages YLD number (uncertainty interval)		Change from 1990
	1990	2019	
Osteoarthritis			
Males	54,633 (27,029–109,301)	139,510 (68,875–277,211)	+155.36%
Females	76,356 (37,808–154,324)	187,568 (93,496–380,792)	+145.65%
Knee osteoarthritis			
Males	38,890 (19,151–80,960)	99,830 (49,013–205,384)	+156.70%
Females	59,875 (29,791–123,147)	148,467 (72,702–302,575)	+147.96%

YLD: years lived with disability

Table 5. Sex-specific knee osteoarthritis age-standardized years lived with disability in Indonesia and globally, 1990 and 2019

Country	Cause of disability	Age-standardized YLD rate (uncertainty interval)		Change from 1990
		1990	2019	
Indonesia	Osteoarthritis			
	Males	108 (54–215)	121 (60–241)	+12.16%
	Females	141 (70–284)	155 (77–314)	+9.65%
	Knee osteoarthritis			
	Males	75 (37–153)	84 (42–173)	+12.71%
	Females	109 (54–222)	121 (59–245)	+11.00%
China	Osteoarthritis			
	Males	169 (84–336)	184 (92–371)	+9.31%
	Females	243 (121–490)	263 (132–535)	+8.37%
	Knee osteoarthritis			
	Males	113 (55–232)	121 (59–248)	+6.43%
	Females	191 (94–390)	205 (100–419)	+7.27%
Malaysia	Osteoarthritis			
	Males	112 (56–227)	127 (62–257)	+13.31%

Country	Cause of disability	Age-standardized YLD rate (uncertainty interval)		Change from 1990
		1990	2019	
	Females	151 (75–305)	170 (84–343)	+12.54%
	Knee osteoarthritis			
	Males	79 (39–161)	89 (44–185)	+13.15%
	Females	119 (58–241)	134 (65–272)	+13.37%
India	Osteoarthritis			
	Males	138 (70–275)	151 (76–302)	+9.47%
	Females	192 (98–379)	298 (106–415)	+8.54%
	Knee osteoarthritis			
	Males	92 (46–189)	102 (50–207)	+10.38%
	Females	130 (65–265)	144 (71–292)	+10.21%
Singapore	Osteoarthritis			
	Males	190 (96–375)	206 (103–420)	+8.54%
	Females	440 (222–885)	461 (231–925)	+4.77%
	Knee Osteoarthritis			
	Males	127 (63–255)	138 (67–281)	+9.05%
	Females	221 (109–445)	236 (116–482)	+6.71%
Global	Osteoarthritis			
	Males	180 (91–355)	187 (94–370)	+4.07%
	Females	256 (131–505)	265 (134–523)	+3.40%
	Knee osteoarthritis			
	Males	104 (52–212)	112 (55–227)	+7.31%
	Females	150 (74–303)	163 (80–331)	+8.66%

YLD: years lived with disability

Comparison of YLD caused by OA to other diseases in Indonesia

Indonesian OA and knee OA age-standardized YLD rates were compared to several diseases (**Table 6**) that were stated to be the top 10 causing death and disability combined in Indonesia by GBD Indonesia profile, namely stroke, diabetes mellitus, low back pain, and COPD. Compared to those diseases, OA had a lower YLD rate either in 1990 or 2019. Although OA has a lower YLD rate, the growth of OA YLD was higher compared to stroke, low back pain, and COPD. Some of them even had an improvement in the YLD rate. Diabetes had a fantastically higher growth rate of YLD in Indonesia compared to OA, but OA can still be considered a concerning disease to highlight since its burden growth is still relatively high compared to other diseases.

Table 6. Sex-specific osteoarthritis years lived with disability and other diseases comparison in Indonesia

Cause of disability	Age-standardized YLD rate (uncertainty interval)		Change from 1990
	1990	2019	
Osteoarthritis			
Males	108 (54–215)	121 (60–241)	+12.16%
Females	141 (70–284)	155 (77–314)	+9.65%
Stroke			
Males	336 (238–433)	368 (260–477)	+9.43%
Females	454 (326–584)	476 (342–616)	+4.82%
Diabetes mellitus			
Males	254 (175–347)	406 (278–553)	+59.76%
Females	221 (153–302)	361 (247–488)	+63.23%
Low back pain			
Males	815 (572–1,088)	765 (539–1,020)	-6.12%
Females	1,164 (823–1,546)	1,103 (777–1,475)	-5.27%
COPD			
Males	265 (216–310)	296 (241–347)	+11.73%
Females	222 (182–260)	198 (162–232)	-10.93%

COPD: chronic obstructive pulmonary disease; YLD: years lived with disability

Discussion

Osteoarthritis has always been considered a wear and tear disease, a degenerative age-related disease [2-4,6,7,11]. However, GBD study in 2019 indicated that the OA trend is changing, and the cases of OA in the younger population are rising. This research analyzed the growing burden and the changing trend of osteoarthritis and knee osteoarthritis in Indonesia from 1990 to 2019 using the publicly established data GBD study 2019. OA prevalence was globally recognized and

has doubled since 1990 [4]. This study has also shown a more than doubled prevalence of OA from 1990 to 2019 in Indonesia alongside the worldwide prevalence of OA, as stated by Long *et al*. [4]. Indonesia even had a greater increase of OA cases than the global population, as the growth of cases was 147.44% for both sexes, while globally, it was only 113.25% over the past three decades. Overall, the knee is still the most prevalent site to get OA as it accounts for 3.1 million cases of knee OA in males and 4.6 million cases in females were detected out of a total of 9.6 million cases of OA in Indonesia in 2019. This shows the concerning increase of OA cases in Indonesia that may be neglected over other fatal diseases.

The increasing incidence of knee OA corresponded to overall OA incidence, knee OA, and overall OA prevalence trends. Data showed an overall increase in the incidence of OA as well as knee OA. Though knee OA growth incidence rate was slightly higher than the overall OA, it might signal a potential factor interplaying with the development of OA, not only mechanical injury. The incidence of knee OA was higher in the female population than in males. Females have smaller joint parameters and dimensions, less cartilage volume and thickness, and higher inflammatory cytokines or higher C-reactive protein concentration, which might cause a higher prevalence of OA in females [14].

The rising case of OA is even higher in Indonesia compared to other countries with similar demographic characteristics. This study sampled four other countries to compare based on their similarity in social demographic characteristics and geographic proximity. Though Indonesia reported a lower prevalence rate, the growth of OA and knee OA prevalence rates were higher than in China, India, Singapore, and globally in both sexes. The increasing trend of OA prevalence tends to be multifactorial in lower-middle and low-income countries, including Indonesia [15]. The data showed that the prevalence of OA increased with age as it was believed to be a wear and tear disease. As we compared the number of cases from 2019 to 1990, it revealed that the growth of OA cases was higher in the younger population. The same applied to the male population. It is now believed that OA is shifting as not only a wear and tear disease but a multifactorial disease [7]. OA is now considered a total "joint failure" with an inflammatory component. Established risk factors such as obesity not only contribute to developing OA through mechanical injury but also inflammatory mechanisms [7]. Meta-inflammation was identified to contribute to joint damage. Higher obesity rates and sports injuries may signal a future surge in OA among the younger population [8]. The increased burden of OA in the younger population might be related to sports injury. Athletes and young adults have a higher risk of developing OA, particularly knees and hips [16]. A systematic review conducted by Bestwick-Stevenson *et al*. showed that the likelihood of developing knee OA increased through wrestling and ice hockey or overall collective participation in sports [16].

This study examined OA burden not only by prevalence and incidence but also by YLD, which represents the OA rate of disability-adjusted life year (DALY). Compared to other top causes of disability included in non-communicable diseases in Indonesia, such as low back pain, stroke, diabetes, and chronic obstructive pulmonary disease, OA had lower YLD [17]. Though the OA burden is not as devastating as that of low back pain, stroke, or COPD, the OA YLD change from 1990 to 2019 was higher than that of COPD, low back pain, and stroke. This signals the burden of OA being concerning despite its lower YLD.

The rising burden of OA may reflect prolonged exposure to OA risk factors like joint overuse, injuries, obesity, and improvement of life expectancy [15]. OA burden surge may be affected by the improvement of life expectancy in Indonesia. According to GBD 2019 data, in 1990, Indonesia had a life expectancy of 65.4 years for the female population and 62.4 years for the male population. In 2019, it was estimated to be 74.3 years and 69.4 years for female and male populations, respectively [13]. The World Health Organization declared that life expectancy at birth for the Indonesian population (both sexes) in 2000 was 67.2 years, which improved by 4.14 years to 71.3 years in 2019. Improvement of life expectancy may increase YLD, which in turn incriminates the OA burden.

Despite lower YLD compared to other diseases, OA burden change is still indicating a rising public health concern in Indonesia since OA is still one of the top 20 causes of disability [17]. OA prevalence and YLD escalation from 1990 to 2019 in Indonesia have led to concern about the burden of OA. Indonesia is facing a double burden of disease with communicable diseases still

highlighted and a rising disability and prevalence of non-communicable diseases [19]. This study provides information to clinicians and the public to be aware of screening and prevention of non-communicable diseases, especially OA as one of the leading causes of disability in musculoskeletal in Indonesia [17].

The increase in osteoarthritis cases may be related to the improvement of OA screening with technology and knowledge development to assess OA; registration and monitoring of cases since the implementation of universal health care (UHC), *Badan Penyelenggara Jaminan Sosial Kesehatan* (*BPJS Kesehatan*) program since 2014; easier access to health care since the implementation of UHC [19], and overall better awareness of OA by society. Three decades have passed, and a lot of development has been implemented. These factors may contribute to increasing OA case detection.

The strength of this study was its capability to provide epidemiological data, which was scarce in Indonesia. This study was one of the handful of epidemiological studies that provided a comparison of OA trends in younger and older populations, OA burden to other diseases, and Indonesian OA burden to the global, allowing clinicians and the general public to be aware of the rising burden of OA.

Several limitations of this study must be acknowledged. First, the GBD study used covariate modeling to generate epidemiological data, which was responsible for the validity of the results [4,11]. Second, wide uncertainty intervals for the OA point data were acknowledged. Finally, this study did not determine OA risk factors. Future studies highlighting OA risk factors might contribute to the limited information.

Conclusion

OA cases have more than doubled from 1990 to 2019 in Indonesia. The incidence of OA and specific knee OA was higher in 2019 than in 1990, with slightly higher growth of incidence in knee OA. Age-standardized incidence rate and prevalence rate showed higher OA rate in females than in males, signaling other possible factors interplaying in the development of OA than just degenerative, such as inflammation and the smaller dimension of the knee in females. The surge of OA cases was also seen globally with Indonesia having a higher prevalence rate growth than China, Singapore, and India. The prevalence rate was shown to increase with age; interestingly growth of the OA prevalence rate was higher in the younger population. Although showing a lower YLD rate compared to low back pain, stroke, diabetes, and COPD, OA had a higher YLD rate growth than those diseases. OA trend is indicating a rising public concern and a leading cause of disability showing Indonesia facing a double burden of disease. Early detection and prevention are keys to improving OA outcomes in Indonesia. A more comprehensive analysis of OA case growth among the younger population is suggested to uncover the OA multifactorial determinants.

Ethics approval

Not required.

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None.

Competing interests

All the authors declare that there are no conflicts of interest.

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Underlying data

Supplementary data supporting the findings of this study is available from the following link: https://figshare.com/s/eb40ebdb962f9a221ec9.

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