Correlation of MRI (Cartilage Defect) Results with Pain in Knee Osteoarthritis Patients: Systematic Review

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Abstract. Background: MRI of the knee is used to determine clinical management and diagnose OA. The characteristics of OA knee often appear even though the knee is not experiencing symptoms or injury. MRI results and the relationship with pain experienced in OA patients differed in each study. In this systematic review, the authors will summarize the relationship between MRI (cartilage defect) results and pain in knee OA patients without experiencing symptoms and injury. Methods: The authors searched through two databases, Pubmed and ScienceDirect. The risk assessment of bias used was Cochrane. Results: The nine articles obtained were processed for a systematic review focusing on the prevalence of cartilage defects in knee OA patients without symptoms or a history of injury. Conclusions: The prevalence of cartilage defects in adults is massive, even though the participants did not feel any problems in the knee. If an MRI is done, there is a possibility that the participant has a cartilage defect.

Keywords: Cartilage defect · MRI · Osteoarthritis

1 Introduction

Osteoarthritis (OA) is a degenerative disease that attacks the joint cartilage and is most often found at the age of over 40 years due to substantially increasing degenerative changes [1–3]. Knee OA patients' main complaints are morning stiffness and decreased physical performance [4, 5]. Injuries to cartilage and degenerative diseases of the joints are common and affect the quality of life, which certainly also affects the annual quality of life in the elderly worldwide [2, 3, 6].

OA is a significant global health problem [7, 8] because OA is a disease with the highest prevalence in the world, thus affecting the global population on a large scale, especially in the knee joint because the knee joint is bodyweight support [7–9]. In Indonesia, the prevalence of OA at the age of 61 is 5%, and 80% of OA sufferers

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experience limited movement, while 25% have difficulty carrying out daily activities [4]. OA knee is the most common cause of the pain experienced by the elderly, so the current management of OA knee is still focused on relieving the existing symptoms [7, 9]. OA knee has several risk factors, such as age, gender, obesity, injury, abnormal joints, excessive physical activity, lack of physical activity, and genetic factors [10].

OA knee is a disease in which early stages are unknown until severe damage to the joint emerges. Hence, OA knee may have existed without symptoms before middle age, but when an MRI is performed, pathology in the knee joint is then found [11, 12]. OA is a mechanical disease observed through the knee joint mechanism and structural and biological factors [11, 12]. OA is carried out after available radiographic results, so treatment is relatively late [13].

The pathology of the knee joint increases with age and may already be present at the time of magnetic resonance imaging (MRI), even without symptoms [12]. MRI of the knee is commonly used to detect acute and chronic internal injuries, so MRI is influential and useful for diagnosing musculoskeletal problems [14, 15]. MRI is a non-invasive technique for accurately diagnosing OA, as well as identifying cartilage lesions, meniscus tears, and ligament injuries [8, 16, 17]. MRI is critical to understand the differences in the tissues in the joints that have OA with symptoms and disease process [18].

In a healthy knee, the cartilage structure can adapt to withstand body loads daily [11]. Kinematic and kinetic changes during walking can shift the location and magnitude of the load on the cartilage, which has implications for the pathogenesis of OA [11]. The prevalence of the characteristics of knee OA on MRI without symptoms and injury varies across studies, from 0% to 75% [1]. Given the large number of adults who undergo MRI to investigate causes of knee symptoms, accurate estimation of the prevalence of knee OA features via MRI without symptoms and history of injury is important to inform the diagnosis and treatment of knee symptoms throughout the lifetime [1]. This study aims to determine if cartilage defects in OA knee are detectable in all adults with degenerative changes or whether they are exclusively found in individuals with symptoms or injuries.

Thus, OA knee is a degenerative disease, but the initial symptoms may appear at a young age. To find out if someone has an OA knee, an MRI is needed to make an accurate diagnosis. Therefore, this study aims to analyze existing studies to summarize the correlation between MRI (cartilage defect) results and pain in the OA knee.

2 Methods

2.1 Research Design

This study used a systematic review study.

2.2 Search Strategy

This research was obtained through 2 databases available online: Pubmed and Science Direct.

The strategy in searching this database was adjusted to the PICO prepared. The keywords used were Cartilage OR Cartilage defect AND MRI AND Osteoarthritis OR OA Knee. As for the articles taken, the release dates were January 2007- October 2022.

2.3 Eligibility Criteria

The inclusion criteria used for the included paper are (i) cohort study, (ii) participants aged over 40 without symptoms, (iii) population total over 50, and (iv) having no injuries or surgery. The exclusion criteria set include: (i) articles more than 15 years old, (ii) e-books, and (iii) not published in English.

2.4 Quality Assessment

This study used Cochrane to assess the risk of bias in cohort studies to assess bias in the articles to be examined. The indicator for assessing the risk of bias in Cochrane is the heterogeneity of the study, the credibility of participant criteria, follow-up, and also the results of the research in the study.

2.5 Data Extraction and Analysis

This study aims to compare the results of heterogeneity [1]. After extracted from each article, the data include the number of participants, participant characteristics, age, and BMI prevalence of cartilage defects in the knee.

3 Result

3.1 Search Result

From the search process through 2 databases, 18,078 articles matched the keywords. After deleting duplicates, 1,714 articles remained, selecting the articles' eligibility through title, abstract, and full-text. After the selection process, the final results of 9 articles were obtained, which would be reviewed further. Details of the article selection process can be seen through the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) flow chart in Fig. 1.

3.2 Characteristics of Study

In this study, 9 articles implemented a Cohort study. There were 2,727 participants aged 30–78 years. This study focuses on the results of MRI regarding the prevalence of cartilage defects. Further information can be seen in Tables 1 and 2.

3.3 Quality Assessment Result

Based on the results of the risk assessment of bias in the 9 articles obtained, the general results have a low risk of bias for most categories, but 3 high biases are found in the population collection, 2 unclear biases in the outcome of the early study, 1 unspecified bias in trust in the outcome, and 1 unspecified bias in follow-up in the cohort.

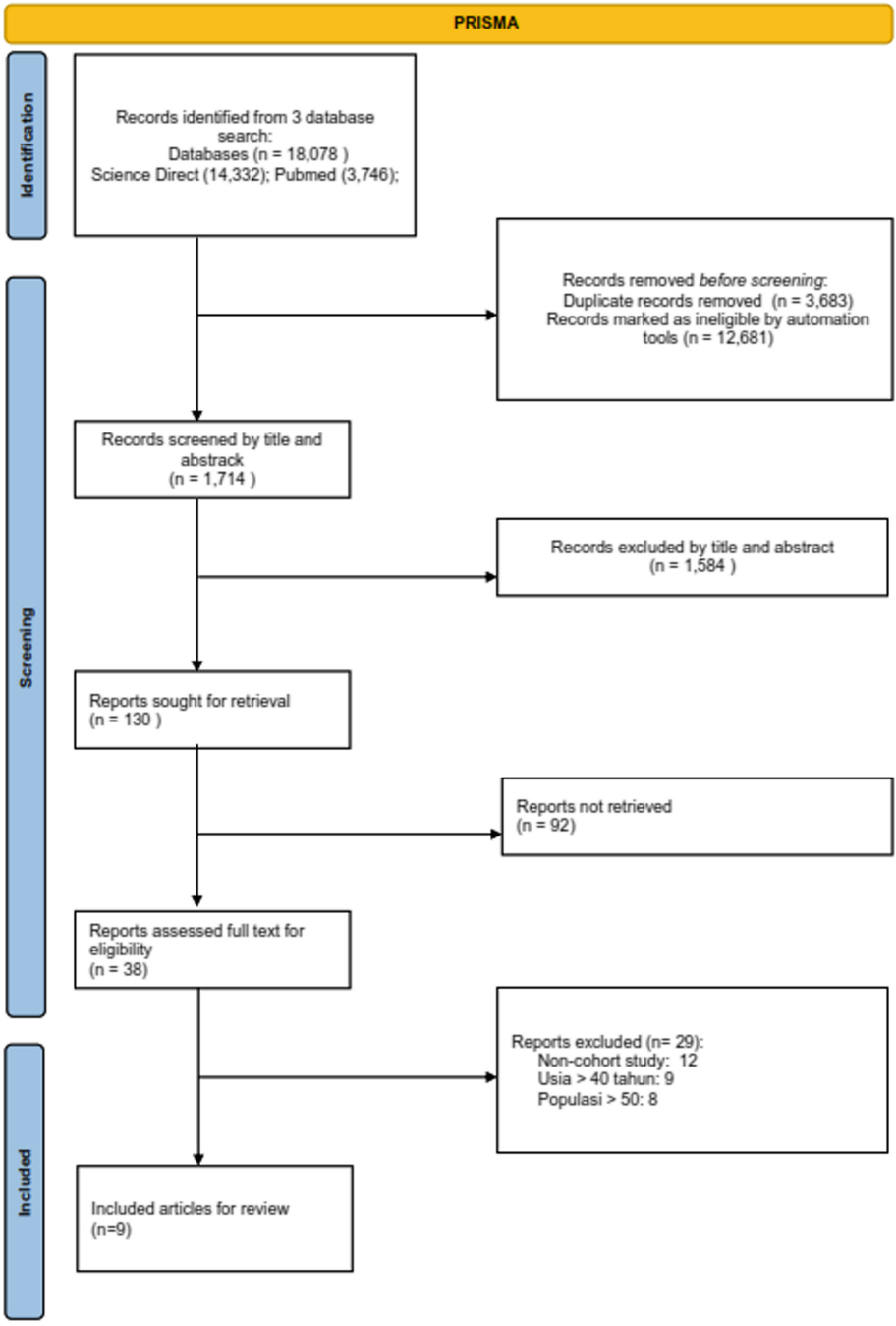
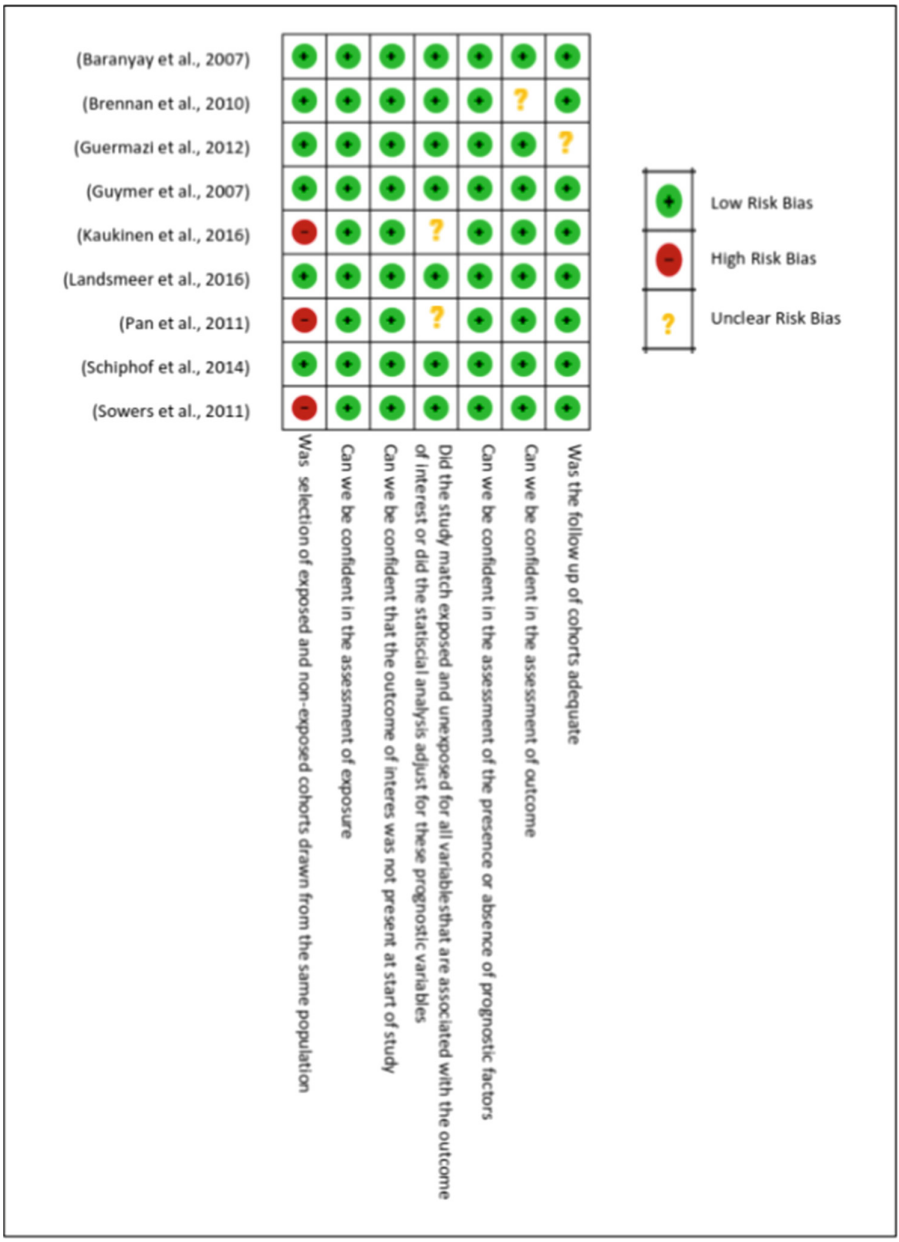

PRISMA
Identification
Records identified from 3 database search:
Databases (n = 18,078)
Science Direct (14,332); Pubmed (3,746);
Records removed *before screening*:
Duplicate records removed (n = 3,683)
Records marked as ineligible by automation tools (n = 12,681)
Screening
Records screened by title and abstrack
(n = 1,714)
Records excluded by title and abstract
(n = 1,584)
Reports sought for retrieval
(n = 130)
Reports not retrieved
(n = 92)
Reports assessed full text for eligibility
(n = 38)
Reports excluded (n= 29):
Non-cohort study: 12
Usia > 40 tahun: 9
Populasi > 50: 8
Included
Included articles for review
(n=9)

Fig. 1. PRISMA

Table 1. Chochrane Risk of Bias Assessment



3.4 Prevalence of Cartilage Defects

Nine studies found a prevalence of cartilage defects, with combined prevalence estimates of all studies, finding that 55% (1484) of participants had cartilage defects. The prevalence of cartilage defects at the age of >40 mostly degenerates in the body. Further information can be seen in Table 2.

In general, women have OA knees more frequently. However, some research has shown that men also experience OA knee since they are more prone to experience mild traumas than women. The majority of previously included papers did not examine the connection between gender differences and the occurrence of cartilage abnormalities any further.

Heterogeneity was not taken into account by other factors evaluated except for the risk of bias. The study's sample size showed that age affected the prevalence of cartilage defects.

Table 2. Characteristics of included articles

Author	Participant	Gender	Age	BMI	Prevalence of Knee with Cartilage Defect
Baranyay et al. 2007	297	186 women & 111 men	58 ± 5.5 (40–69 years)	25.2 ± 3.8	184 (62%)
Brennan et al. 2010	142	142 women	42 ± 5	27.3 ± 6.3	76 (64%)
Guermazi et al. 2012	434	220 women & 214 men	63 ± 8 (51–89 years)	27.3 ± 4.8	284 (66%)
Guymer et al. 2007	176	176 women	52 ± 7 (40–67 years)	27.1 ± 5.5	56 (56%)
Kaukinen et al. 2016	63	38 women & 25 men	55 ± 14	24.8 ± 3.2	54 (86%)
Landsmeer et al. 2016	473	300 women & 173 men	56 ± 3 (50–60 years)	32.2 ± 4.3	305 (65%)
Pan et al. 2011	95	37 women & 58 men	55 ± 8 (45–78 years)	24.2 ± 2.9	57 (60%)
Schiphof et al. 2014	888	424 women	55 ± 4	26.3 ± 4.3	222 (25%)
Sowers et al. 2011	259	159 women	57 ± 3	29.9 ± 6.3	246 (95%)

4 Discussion

This systematic review aimed to identify the prevalence of cartilage defects on MRI results in asymptomatic knee OA patients with no history of injury. Therefore, cartilage defects are also owned by knee OA patients without symptoms and with no history of injury, not only knee OA patients with symptoms or who have had a history of injury.

The high prevalence of asymptomatic OA knee in adults (>40 years old) explains that intervention for OA knee is no better than surgery. There is an increase of 10%-

15% per decade for cartilage defects [1]. Meta-regression shows that three-quarters of adults aged 70 have asymptomatic cartilage defects [1]. Even though a human is normal and does not feel pain in the knee when an MRI is done, there is a possibility that he has a cartilage defect.

A high prevalence of intra-articular defects is also present in hip cartilage defects, even when they are asymptomatic [26]. Evidence shows that the cartilage defect, one of the features of asymptomatic knee OA, may not completely return to its original state [1]. However, further structural abnormalities of the knee joint were not evident in radiological studies focused on OA knee [27].

From the research, being overweight in adults over 40 does not significantly affect cartilage degeneration in patients with OA knee. There is a correlation between early degenerative knee disease and the prevalence of severe cartilage defects. However, cartilage defects are also present in healthy participants [21].

Crepitus at the knee is often interpreted as a sound indicating damage to the cartilage in the knee [24]. Detected bias is associated with less experienced researchers, which can lead to more errors seen from the existing risk of bias.

This study can help determine the prevalence of cartilage defects in knee OA, making it easier for readers to know the results of this prevalence in adults over 40 years old. Limitations of this study also include the heterogeneity between studies that the included variables cannot explain. These unexplained factors are related to the subjective nature of the evaluation of the MRI results, experience, and the contribution of the prevalence of cartilage defects in knee OA.

5 Conclusion

In this systematic review, the results of the prevalence of cartilage defects through MRI in patients with asymptomatic OA knee and no history of injury found that 55% of the population had cartilage defects. The high prevalence of adults over 40 years experiencing OA knee without symptoms and injury proved that OA knee is a degenerative disease causing intervention or surgery on the knee joint, unable to restore the joint to its original state. Gender was not so influential because, genetically, women experience OA knee more often, but men also experience OA knee due to minor injuries, not genetics.

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