# Relation Between Osteoarthritis Grading Scale with Cartilage Ultrasonographic in Knee Osteoarthritis Patient at RSU Al Fauzan Period of 2016-2017

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## ABSTRACT
*Osteoarthritis is a degenerative joint disease which is related with the damage of cartilage. X-Ray is one of the osteoarthritis radiological examinations but only to see the damage of bone not cartilage. One of an effective examination to visualize the damage of cartilage is Ultrasound. The objective of this study is to determine the relation between osteoarthritis grading scale with cartilage ultrasonographic in knee osteoarthritis patients. This was a Cross-sectional study on 32 knee osteoarthritis patients based on Total Sampling technique at RSU Al Fauzan period of 2016-2017. Statistical analysis was performed using Kolmogorov-Smirnov Test showed there was a correlation between osteoarthritis grading scale with cartilage ultrasonographic. The conclusion in this study, there is a significant correlation between osteoarthritis grading scale with cartilage ultrasonographic in knee osteoarthritis patients.*

### Keywords
Knee Osteoarthritis, Ultrasound, X-Ray.

### Introduction
Osteoarthritis (OA) is a degenerative disease caused by damage of joint cartilage [1]. Osteoarthritis usually affects the weight-bearing joints such as the knees, the pelvis, the vertebrae, but may also affect the shoulders, joints of the fingers, and ankles [2].

The prevalence of OA in Indonesia reaches 15.5% in men and 12.7% in women. According to the World Health Organization (WHO), the prevalence of OA in the world in 2004 reached 151.4 million people and 27.4 million people are in Southeast Asia [4]. According to Soenarto [4], at the age of 15 years old the prevalence of joint / rheumatic disease is 24.7%.

East Nusa Tenggara Province is the province with the highest prevalence of OA which is about 33,1% and province with the lowest prevalence is Riau which is about 9% while DKI Jakarta occupies fourth position of OA prevalence equal to 21,8% [4].

Cartilage knee joint is a 5mm thick layer of hialin that covers the bones and performs the function, and the needs of joint movement. The cartilage has no blood vessels, nerves, lymphatics and pericondrium. Nutrition takes place in diffusion with low cell metabolism, limited and anaerobic. These structures and functions cause a low healing ability, so it generates scar tissue [3].

According to WHO, the diagnosis of OA can be established by physical examination and also investigation of arthroscopy, MRI and X-Ray. Until now, examination of the inside joint (arthroscopy) is still a standard gold examination in diagnosing OA disease. One of the radiological examinations in diagnosing OA is X-Ray. X-Ray examination only can see bone damage but not with cartilage. The description of OA in radiological examination X-rays are classified according to Kellgren and Lawrence and grouped into five grades (0-4). The description may be osteophytes, joint narrowing, and sclerosis [3].

In one literature said that the examination can be an alternative in diagnosing OA is ultrasound (US) [5]. Ultrasound examination has several advantages that can detect osteofit, cartilage degeneration, and become a reference in joint injection that cannot be determined by other examination [5]. The research of Jonathan K. Kazam and

team at Thomas Jefferson University Hospital, said that ultrasound can be a routine check to detect abnormalities in cartilage [7].

All this time, the classification of OA is based from X-Ray while X-Ray is imaging to see bones instead of tissue. Therefore, researchers wanted to study the relationship between OA grading scale and cartilage ultrasonographic in knee OA patients.

The results of this study is expected to give another information for the medical science, especially in the field of orthopedic so it can be an alternative to the diagnosis and also examination of knee OA support.

## Materials and Methods

The research used an observational analytic with cross-sectional design. This study was held to determine the relationship between OA grading scale with cartilage sonographic in Knee OA patient at RSU Al Fauzan Period of 2016-2017.

Respondent were all patients who met the following criteria, diagnosed with knee OA, having an x-ray examination of the knee, having an ultrasound examination of the knee and a minimum age of 25 years old at RSU Al Fauzan from 2016 to 2017.

This research used Non Probability Sampling method with Total Sampling technique, which is researchers choose respondent based on subjective and practical consideration.

The type of data used in this study is secondary data, data obtained from medical records of knee OA patients. The data collected will be verified and entered into the database which is then analyzed.

## Results and Discussions
### Univariate Analysis
The univariate analysis included the distribution of age, sex and OA grading scale in knee OA patients at RSU Al Fauzan.

Patient distribution based on age (Table 1), Middle Age (45-59) with 15 people or 46.9% was the highest group in this study. Based on gender (Table 2), the result of respondents with the most gender found were women with 23 people or 71.9%. As seen in table 3, the highest grade of knee OA using Kellgren and Lawrence was grade III with 19 people or 59.4%. Based on table 4, the highest score of US was score 3-4 with 25 people or 78.1%.

| AGE | N | (%) |
|---|---|---|
| Adult (27-44) | 12 | 37.5 |
| Midlle Age (45-59) | 15 | 46.9 |
| Elderly (>60) | 5 | 15.6 |

Table 1: Patient Distribution Based On Age.

| Gender | N | (%) |
|---|---|---|
| Men | 9 | 28.1 |
| Women | 23 | 71.9 |

Table 2: Patient Distribution Based On Gender.

| X-RAY RESULT | N | (%) |
|---|---|---|
| Grade I | 0 | 0 |
| Grade II | 7 | 21.9 |
| Grade III | 19 | 59.4 |
| Grade IV | 6 | 18.8 |

Table 3: Distribution of OA Grading Scale Based On Kellgren and Lawrence.

| US Score | N | (%) |
|---|---|---|
| Score 1-2 | 7 | 21.9 |
| Score 3-4 | 25 | 78.1 |

Table 4: Patient Distribution Based On US Score Table.

| X-RAY RESULT | USG SCORE | | | | TOTAL | | P value |
|---|---|---|---|---|---|---|---|
| | Score 1-2 | | Score 3-4 | | | | |
| | N | (%) | N | (%) | N | (%) | |
| Grade I | 0 | 0 | 0 | 0 | 0 | 0 | |
| Grade II | 7 | 21.9 | 0 | 0 | 7 | 21.9 | |
| Grade III | 0 | 0 | 19 | 59.4 | 19 | 59.4 | 0.000 |
| Grade IV | 0 | 0 | 6 | 18.8 | 6 | 18.8 | |
| TOTAL | 7 | 21.9 | 25 | 78.1 | 32 | 100 | |

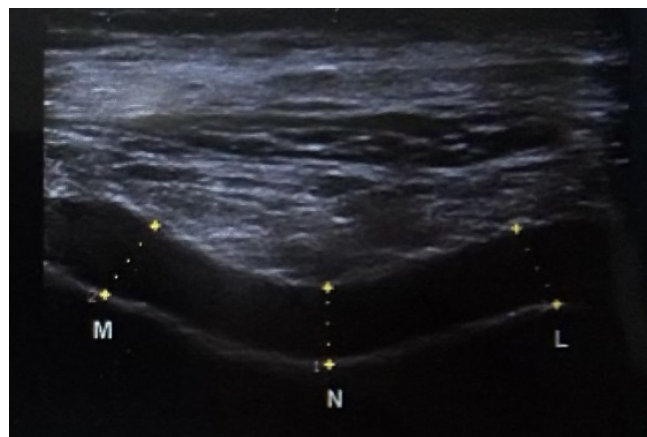Table 5: Relation Between OA Grading Scale with Cartilage Ultrasonographic in Knee OA Patient.



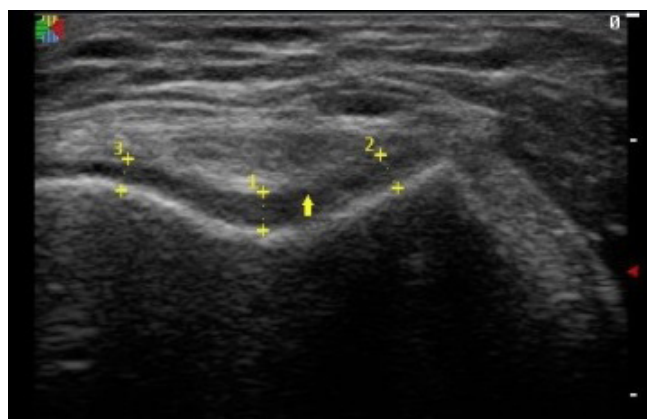Figure 1: Cartilage ultrasonographic normal.



Figure 2: Grade II (using KL) result: a blurring joint space and an irregulerity in the surface of the cartilage.
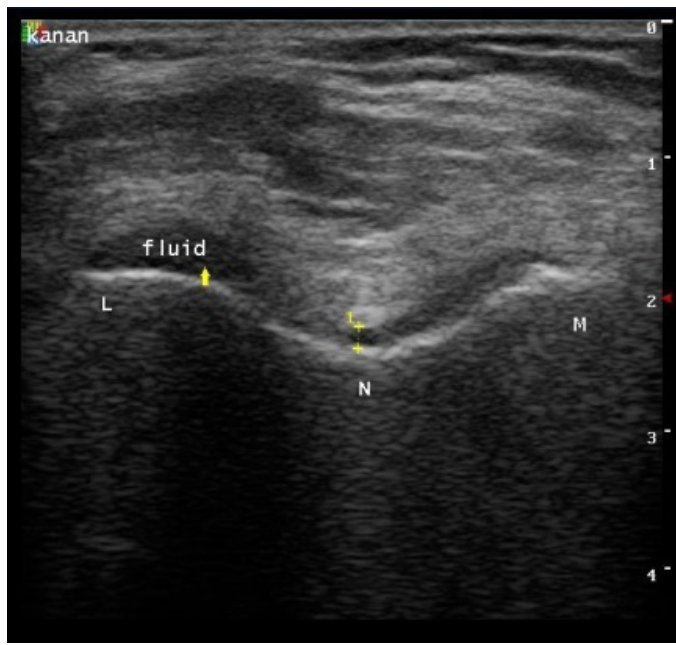
**Figure 3:** Grade III (using KL) result: a blurring joint space, an irregulerity in the surface of the cartilage and narrowing of joint space.
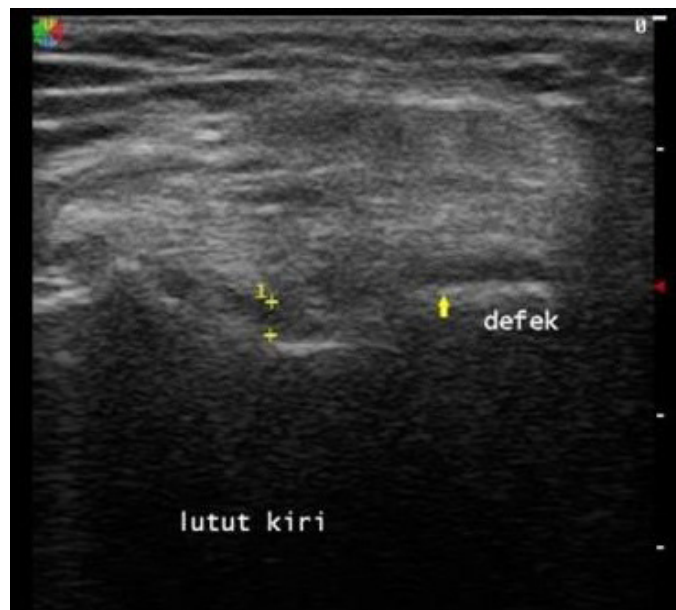


**Figure 4:** Grade IV (using KL) result: a blurring joint space, an irregulerity in the surface of the cartilage, narrowing of joint space and the existence of cartilage defects.

## Discussion of Univariate Analysis

The patient distribution based on age, the highest group was Middle Age (45-59 years) with 15 people or 46.9% and the lowest was elderly (> 60 years) with 5 people or 15.6%. This result is in accordance with Heidari's [8] study which states that in the study the highest group was 55 years old. The process of aging is one of the main risks that can lead the joints of body, especially the knee joint being inflammation or swelling that is progressive with age. The process of aging in various studies mentioned starting from the age of 40-45 years depending on individual health conditions.

The highest sex distribution in this study was women with the percentage of 71.9% or 23 respondents. Osteoarthritis in women according to the literature cannot be explained scientifically. This is in line with Mutiwara [10] study which states that 75% of OA occur in women more than men. In the Hame [9] study, there may be several factors that could be the reason for the increased risk of OA in women, among others, anatomical, traumatic and genetic differences as well as hormones. Anatomical differences in men and women who can support OA are narrow femur, thin patellas, larger quadriceps, and tibial condylar size differences. Although all the things that have been mentioned can happen, but there is no research that can prove that all is related to the increase in the incidence of OA.

In this study, the highest distribution of OA patients based on Kellgren and Lawrence grading scale was grade III and the lowest was in patients with grade II. In Mutiwara [10] study, patients diagnosed with grade III knee OA was the highest group of all the Kellgren and Lawrence grading scale.

## Bivariate Analysis

Based on the analysis table (Table 4) of relationship between OA grading scale with cartilage ultrasonographic in knee OA patients, shows that patients who have ultrasound scored 1-2 with 7 patients and for ultrasound scored 3-4 with 25 patients.

Bivariate analysis used to determine the relationship between OA grading scale with cartilage ultrasonographic in knee OA patient was Kolmogorov-Smirnov test, but it was not eligible then it continued with an alternative test that was Kolmogorov-Smirnov Test. Based on the results of Fisher statistical tests can be concluded there was a significant correlation between OA grading scale with cartilage ultrasonographic in knee OA patients with p value <0.05.

## Discussion of Bivariate Analysis

This research used Kolmogorov-Smirnov test at first but because it was not eligible then it continued with an alternative test that was Kolmogorov-Smirnov Test. In the Kolmogorov-Smirnov Test showed p value of 0.000 or p value less than 0.05, there was a correlation between the degree of OA with cartilage ultrasound picture in knee OA patients. The results of Kazam [7] showed that ultrasound can be a routine check to detect abnormalities in cartilage. According to Mortada [6] research, US can reliably detect the severity of KOA with the results good agreement was found with a total sensitivity of 94.6% and a total specificity of 93.3%.

Kellgren and Lawrence Grading Scale is the scale of cartilage damage of knee joints seen through X-Ray examination and divided into five grades (0-IV) by assessing the narrowing of joint space, increased subcondral bone density, bone cysts, osteophytes at joints and changes in joint anatomy can be found at the time of radiological examination. The X-Ray examination can see bone damage but cannot visualize the abnormality of the cartilage.

In one literature mentioned that the examination that can be an

alternative in diagnosing knee OA is ultrasound (US) [5]. This is supported by the research of Jonathan K. Kazam [7], and team, at Thomas Jefferson University Hospital said that ultrasound can be a routine check to detect abnormalities in cartilage.

On sonography, normal hyaline articular cartilage has a well-defined anechoic or homogeneously hypoechoic appearance with uniform thickness. Osteoarthritis initially appears as a loss of the well-defined contour and varying echogenicity of the cartilage layer [10]. In advanced stages, the cartilage narrows asymmetrically, followed by abnormalities in the subchondral bone [8]. In a purely descriptive study, Grassi [11] reported a spectrum of abnormalities in patients with osteoarthritis, including loss of sharpness of the interface between the cartilage and synovial space, loss of clarity of the cartilage, and cartilage narrowing.

This study used the US scale made by an orthopedic surgeon at RSU Al Fauzan to detect or assess cartilage through ultrasound by looking at irregularity in the surface of the cartilage, the narrowing of joint space, the blurring of joint space and cartilage defects. From the 32 patients studied, there were 7 patients of grade II with an US score 2 where the cartilage ultrasonographic found a blurring joint space and an irregularity in the surface of the cartilage. Patients with grade III with ultrasound score 3 were 19 patients which cartilage sonographic found there were a blurring joint space, an irregularity in the surface of the cartilage and narrowing of joint space. While the other 6 patients get the results of grade IV with ultrasound score 4 which the cartilage ultrasonographic is a blurring joint space, an irregularity in the surface of the cartilage, narrowing of joint space and the existence of cartilage defects.

Concisely, this study shows the correlation between OA grading scale using Kellgren and Lawrence with cartilage ultrasonographic in knee OA patients (p <0.05) and also US can reliably detect the severity of KOA.

## Conclusion
Based on the results and discussion, it can be concluded the distribution of patients based on age, the highest group is Middle Age (45-59) with 46.9%, the highest distribution of patients based on sex is women with 71.9%, and the distribution OA grading scale based on Kellgren scale and Lawrence the highest is grade III with 59.4%. There is a significant correlation between OA grading scale with cartilage ultrasonographic in knee OA patients.

## References
1. Supartono, Basuki. Effectiveness of Platelet-Rich Plasma In Osteoarthritis Of The Knee Joint. BJSM. 2016; 50: A2-A3.
2. Supartono, Basuki. The Influence of Scoliosis towards Secondary Osteoarthritis Of The Knee Joint In Athletes. BJSM. 2016; 50: A33.
3. Supartono, Basuki. Hyaline Cartilage Regeneration on Osteochondral Defects by Intraarticular Injection of Human Peripheral Blood CD34+ Stem Cells, Hyaluronic Acid and Growth Factor In a Rat Model. BJSTR. 2018; 7:1-10.
4. Soenarto. Reumatik pada, Usia Lanjut. Buku Ajar Boehi-Darmojo Geriatri (Ilmu Kesehatan Usia Lanjut). Edisi 4. Jakarta: Balai Penerbit FKUI. 2010; 433-437.
5. Jacobson, Jon A. Fundamental of Musculoskeletal Ultrasound Edition 2. Philadelphia: Elsevier Saunders. 2013.
6. Mortada, Mohamed, Ayman Z, et al. Reliability of a Proposed Ultrasonographic Grading Scale for Severity of Primary Knee Osteoarthritis. SAGE Journal. 2017; 9:161-166.
7. Kazam, JK, Levon N, Theodore T, et al. Sonographic evaluation of femoral trochlear cartilage in patients with knee pain. Wiley Online Library. 2011; 30:707-802.
8. Heidari, Behzad. Knee Osteoarthritis Prevalence, Risk Factors, Pathogenesis, and Features: Part I. Caspian J Intern Med. 2011; 2: 2015-2112.
9. Hame SL, Alexander RA. Knee Osteoarthritis in Women. Curr Rev Muskuloskelet Med. 2013; 6: 182-187.
10. Mutiwara E, Najirman, Afriwardi. Hubungan Indeks Massa Tubuh dengan Derajat Kerusakan Sendi pada Pasien Osteoartritis Lutut di RSUP Dr. M. Djamil Padang. Jurnal Kesehatan Andalas. 2016; 5: 376-380.
11. Grassi W, Lamanna G, Farina A, et al. Sonographic Imaging of Normal and Osteoarthritis Cartilage. Elsevier. 1999; 28: 398-403.