



## Original Article

## Predictive Value of Neutrophil Lymphocyte Ratio in Assessing Severity Grades of Knee Osteoarthritis

Muhammad Waqar Arif<sup>1</sup>, Ghulam Abbas Khan Niazi<sup>2</sup>, Ahsan Amer<sup>3</sup>, Wasim Ali<sup>1</sup>, Sehr Zara Amir<sup>1</sup> and Faizan Badar<sup>1</sup>

<sup>1</sup>Department of General Medicine, Pak Emirates Military Hospital, Rawalpindi, Pakistan

<sup>2</sup>Department of Rheumatology, Pak Emirates Military Hospital, Rawalpindi, Pakistan

<sup>3</sup>Department of General Medicine, Fauji Foundation Hospital, Rawalpindi, Pakistan

## ARTICLE INFO

**Keywords:**

Neutrophils, Knee Osteoarthritis, Severity, Biomarker

**How to Cite:**

Arif, M. W., Niazi, G. A. K., Amer, A., Ali, W., Amir, S. Z., & Badar, F. (2024). Predictive Value of Neutrophil Lymphocyte Ratio in Assessing Severity Grades of Knee Osteoarthritis : Neutrophil-Lymphocyte Ratio (NLR) an Indicator in Knee Osteoarthritis. *Pakistan Journal of Health Sciences*, 5(07). <https://doi.org/10.54393/pjhs.v5i07.1396>

**\*Corresponding Author:**

Muhammad Waqar Arif  
 Department of General Medicine, Pak Emirates Military Hospital, Rawalpindi, Pakistan  
[waqararif238@gmail.com](mailto:waqararif238@gmail.com)

Received Date: 29<sup>th</sup> March, 2024

Acceptance Date: 11<sup>th</sup> June, 2024

Published Date: 31<sup>st</sup> July, 2024

## ABSTRACT

Osteoarthritis is a disease with a significant inflammatory component. Neutrophil Lymphocyte Ratio (NLR) level is a marker to determine inflammation. **Objective:** To find the value of NLR ratio in assessing severity grades of knee osteoarthritis. **Methods:** Prospective Observational Study was carried out in Tertiary care hospital on 378 patients diagnosed both clinically and radiographically with Knee osteoarthritis reported to tertiary care hospital were selected. Convenience sampling was performed. Patients were divided into, group A, B and C Mild, moderate and severe Knee osteoarthritis with 126 patients. Blood samples were taken from participants and total and differential leucocyte counts and neutrophil levels were determined. NLR value was determined in each group. Mean value was calculated. **Results:** Out of 378 patients, 172 (45.5%) were female and 206 (54.5%) were male. The mean value of NLR ratio in group A was found to be  $2.96 \pm 0.84$ . Mean value in group B was found to be  $5.83 \pm 1.52$  and for grade 3 was found to be  $8.86 \pm 2.33$ . **Conclusions:** NLR value is a good indicator for assessing severity grades of Knee osteoarthritis.

## INTRODUCTION

Osteoarthritis is an illness marked by bone hyperplasia, articular cartilage degeneration, and joint destruction. It is a degenerative joint disease, involving joints only and sparing internal organs. It is the fourth most common joint disease and the most common form of the arthritis. Joint stiffness and limitation of joint movement is hall mark of the disease [1]. It involves both the genders, male and female but the condition primarily affects women. One of the reason woman are prone to osteoarthritis is there hormonal change and less bone density. Its incidence climbed from 13.8% to 21.6% in 2018 [2, 3]. In Pakistan, knee osteoarthritis (OA) was reported to be diagnosed in 3.6% of rural and 3.1% - 4.6% of urban areas in Northern Pakistan [4]. Knee OA is a degenerative, long-term bone joint illness.

The solid and intricate framework of articular cartilage that resists pressure has usually already been destroyed by the time pain and dysfunction is detected [10]. Early diagnosis is now the most important factor in the prevention and management of knee OA. Diagnostic imaging, including radiography, is the most widely used technique. Early knee OA imaging alterations are not readily apparent [5]. These days, complicated joint exams such as MRIs, CT scans, X-rays, rheumatoid factors, mucin, and erythrocyte sedimentation rate are used to diagnose osteoarthritis; however, by the time arthroscopy and bone scanning are used to find the disease, it has usually moved to an advanced level [6]. Knee pain and function are correlated with many synovial cytokines [7]. Through expressing

modifications to cytokines, microRNAs, and metabolites, inflammatory pathways play a significant role in the pathophysiology of OA [8]. The Neutrophil to Lymphocyte Ratio (NLR) is an easy-to-use indicator of overall inflammation. It has proven effective in forecasting cardiovascular and cancer outcomes [9]. More recently, NLR has been suggested as a separate factor to influence the postoperative phase following an arthroplasty and predict the radiographic severity of the hip and knee [10]. The aim of present study was to determine the predictive value of Neutrophil Lymphocyte ratio in assessing severity grade of knee osteoarthritis.

## METHODS

This prospective study was carried out on 378 patients with knee osteoarthritis. Sample size was calculated using WHO sample size calculator using reported prevalence of knee osteoarthritis as 56.7% [11]. Patients aged 20 years or above reporting to medicine Department in Tertiary Care Hospital in Rawalpindi were included in the study. Convenience sampling was performed. The study commenced after due approval of methodology and concept by Ethical Committee of Pak-Emirates Military Hospital Rawalpindi, Pakistan and granted ethical clearance ERC Letter Number: A/28/ER/15/23. Also written permission was taken from patients. The study was conducted from June 2022 to December 2022. Inclusion Criteria Include Patients age 20 years or above, Patient diagnosed clinically and radio graphically with knee osteoarthritis. Exclusion Criteria include Patient with complicated diseases such as tumors, carcinoma, and patients allergic to medicine used in this study, mental and psychologically disable. On enrollment, complete medical and smoking histories, as well as information about current pharmacologic treatments, were acquired. Baseline data was collected related to demographic characteristic, past medical history and co-morbidities. Respondents were divided into 3 groups based on history, clinical, radio graphical, and total time of medication used, with 126 patients in each group, group A, B and C, Grade 1 and 2 as mild, Grade 3 as moderate and Grade 4 as severe knee osteoarthritis based upon Kellgren and Lawrence grading. Blood samples were taken from participants and BMI Index were measured Body Mass Index (BMI) was calculated as the ratio of body weight  $\text{kg/m}^2$ . [12]. Total and differential leucocyte counts, absolute eosinophil and neutrophil levels were determined. NLR was determined by dividing the neutrophil count by the lymphocyte count. NLR value was determined in each group. Mean value was calculated. Independent T test was applied between Group A vs Group C of NLR, and p value ( $p < 0.05$ ) was considered statistical significant. SPSS version 26.0 was used to collect enter, and analyses the data. The mean  $\pm$  Standard Deviation (SD)

was computed for quantitative data, while frequency and percentage were determined for qualitative data.

## RESULTS

This prospective study was carried out on 378 patients. Out of which 210 (55.5%) were female and 168 (44.4%) were male (Table 1).

**Table 1:** Gender Distribution of Respondents

Gender	Female N (%)	Male N (%)
	172 (45.5%)	206 (54.5%)

For age distribution, only 90 (23.8%) had age  $< 30$  years, 201 (53.17%) had age 31-60 years and rest 78 (20.6%) had age  $> 60$  years. BMI index showed that mean BMI index was  $34.23 \pm 4.23$ , out of total 378 patients, only 20 (5.2%) had normal BMI Index, 34 (8.9%) were overweight, 116 (30.6%) were obese I, 112 (29.62%) were obese II and 96 (25.3%) were obese III (Table 2).

**Table 2:** BMI Index of Respondents

Normal BMI N (%)	Overweight N (%)	Obese I N (%)	Obese II N (%)	Obese III N (%)
20 (5.2%)	34 (8.4%)	116 (30.6%)	112 (29.62%)	96 (25.3%)

They were divided into 3 groups based upon severity grades of Knee Osteoarthritis. The mean value of NLR ratio in group A was found to be  $2.96 \pm 0.84$ . Mean value in group B was found to be  $5.83 \pm 1.52$ . And for grade 3 mean value was found to be  $8.86 \pm 2.33$  (Table 3).

**Table 3:** Mean NLR Ratio in Mild, Moderate and Severe Arthritis

Variables	Mean $\pm$ SD
Mild (Group A)	$2.96 \pm 0.84$
Moderate (Group B)	$5.83 \pm 1.52$
Severe (Group C)	$8.86 \pm 2.33$

Independent T test was applied between group A and C. P value came out to be  $p < 0.0002$ . Hence results here proved that NLR ratio is a good indicator in assessing severity grades of knee osteoarthritis.

## DISCUSSION

This study was carried out on 378 patients. Group C with Severe osteoarthritis had predictive value of  $8.86 + 2.33$ . This study is first study conducted in Pakistan measuring the predictive value of NLR in assessing severity grades of knee osteoarthritis. The results of present study is in accordance to a study carried out by Shekhar et al., study conducted in India where they found that NLR ratio is a good inflammatory marker in RA, present study focus on NLR predictive values in assessing severity grades of osteoarthritis [13]. Present study found that patients NLR ratio kept on increasing as severity grades increases, the results are in accordance to a study carried out by Marius et al. Research conducted in Romania in patients with mild and advanced stage knee NLRs were higher in patients with end disease than in the group with moderate OA [14].

Present study considered, 1.45 as a normal value for NLR, the results are in accordance to a study carried out by Forget *et al.*, a healthy adult's normal NLR value should be 1.65, but within a wider range of 0.78 – 3.53 [15]. Present study found that NLR is linked to inflammation the results are in accordance to a study where NLR is associated with inflammatory arthritis activities, including lupus, psoriasis, ankylosing spondylitis, and rheumatoid arthritis. Platelet to lymphocyte ratio and mean platelet volume are also linked to this association [16]. Present study found that NLR is associated with presence on OA and its severity the results are in accordance to a meta-analysis and systematic review where only NLR was linked to the severity of the disease, but both PLR and NLR were connected with the presence of OA [17]. Patients with osteoarthritis had considerably higher levels of NLR in their peripheral blood, indicating a possible role for them in the onset and progression of the condition. The results of Cheng *et al.*, and Gundogdu *et al.*, (NLR in osteoarthritis) are in line with this [18, 19]. According to the correlation between the severity of OA and the variables that showed significant connection on univariate analysis in older age and higher NLR were remained strongly linked with severe OA, According to earlier research, old age is a major risk factor for OA and is linked to severe OA [20]. Present study found that, NLR was positively and significantly was associated with Knee osteoarthritis, and values are usually greater than 2.1. The results are in accordance to a study where they found that age and NLR over 2.1 were predictive of advanced OA [21].

## CONCLUSIONS

The present study concluded that predictive value of Neutrophils to lymphocyte ratio for severe arthritis is  $9.11 \pm 2.26$ . The presence of Osteoarthritis and severity is linked to NLR. The NLR ratio was linked to OA in the knee that was symptomatic.

## Authors Contribution

Conceptualization: MWA

Methodology: AA, WA

Formal analysis: SZA, GAKN

Writing, review and editing: FB

All authors have read and agreed to the published version of the manuscript.

## Conflicts of Interest

The authors declare no conflict of interest.

## Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

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