

Prospective evaluation of pattern and progression of Early Undifferentiated Arthritis in a Tertiary Care Hospital of Bangladesh

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ABSTRACT

Background: Early undifferentiated arthritis (UA) is a common presentation in rheumatology practice, with variable outcomes ranging from spontaneous remission to progression to chronic inflammatory arthritis. Identifying predictors of disease persistence is crucial for guiding early treatment decisions. **Methods & Materials:** This prospective observational study was conducted at Bangladesh Medical University (BMU) formerly BSMMU, Dhaka, from September 2020 to March 2022. Adult patients (≥ 18 years) with early inflammatory arthritis (duration ≤ 1 year) not fulfilling classification criteria for any specific rheumatic disease were enrolled and followed for 6 months. Disease activity was assessed using DAS-28 CRP and ASDAS-CRP. Logistic regression analysis was performed to identify independent predictors of persistent UA. **Results:** Of 63 enrolled patients, 51 (80.4%) completed the study; 41 (80.4%) were female, mean age 38 ± 8.6 years. At 6 months, 39 patients (76.5%) remained as persistent UA, 11 (21.6%) achieved remission, and only 1 (2.0%) progressed to rheumatoid arthritis. Significant predictors of persistent UA included higher number of involved joints (OR 4.7, 95% CI 1.08–20.9, $p=0.03$), while longer symptom duration (OR 0.1, 95% CI 0.02–0.8, $p=0.02$) and higher tender joint count (OR 0.2, 95% CI 0.05–0.9, $p=0.03$) were associated with lower odds. Age, sex, smoking, pattern of involvement, morning stiffness, and swollen joint count were not significant predictors. **Conclusion:** Most patients with early UA remained undifferentiated at 6 months; only a small proportion progressed to RA. Joint involvement count, symptom duration, and tender joint count were significant predictors of disease persistence.

Keywords: Undifferentiated arthritis, early inflammatory arthritis, disease progression, remission, Bangladesh

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INTRODUCTION

Inflammatory arthritis is extremely variable in terms of its presentations, outcome and response to treatment. It may represent various range of diseases which can be self-limiting as well as can progress to chronic disease affecting normal daily activities thus hampering quality of life. It is a manifestation of various rheumatic diseases, but in early stages patients may not always fulfill the criteria of any specific disease. Early arthritis is usually considered to be of duration less than 1 year, but a variation between 3 months and up to 3 years are accepted by various early arthritis clinics worldwide [1,2]. Many early arthritis studies have given importance to patients presenting with extensive joint involvement only and thus not much is known about the characteristics and prognosis of early arthritis patients presenting with mono or oligoarthritis [3]. The annual incidence of early inflammatory arthritis ranges from 115 to 271 per 100000 adults and the incidence of undifferentiated arthritis ranges from 41 to 149 per 100000 adults worldwide [4]. In context of Bangladesh, the incidence of undifferentiated arthritis is 770 per 100000 [5]. Among all inflammatory arthritis 44.3% patients are diagnosed as rheumatoid arthritis, 40.4% remain as undifferentiated

arthritis followed by psoriatic arthropathy and ankylosing spondylitis which represent about 2.7% and 0.2% respectively [4].

Any arthritis of recent onset which cannot be classified according to already available classification criteria for any specific rheumatic diseases is called early undifferentiated arthritis. The time duration for early undifferentiated arthritis ranges from a period of six weeks to one year. About 30% of patients of early undifferentiated arthritis develop rheumatoid arthritis while 40-50% may remit spontaneously [6]. In the early phase of undifferentiated arthritis there are insufficient studies to know more about the outcome and prognostic factors of such patients. There is a belief that a patient who is diagnosed as undifferentiated arthritis are not in need of disease modifying anti-rheumatic drug treatment [7]. There is a need-to-know which patients are at risk of developing persistent disease, so that they can be treated more aggressively from the very early stage, and to avoid inappropriate treatment of patients more prone to remission. To predict a patient's future disease course many studies has been trying to know the factors soon after the onset of symptoms [8]. Presence of auto antibodies in high titre, symmetric arthritis, erosion on radiograph, prolong morning

stiffness, smoking history are some characteristics which help on predicting the development of future rheumatoid arthritis [9].

Majority of patients with undifferentiated arthritis goes into remission. Factors predicting remission of undifferentiated arthritis still remain unidentified [1]. The importance for early diagnosis is to prevent joint destruction and disability and to start treatment where necessary. The very first few months after the onset of symptoms is pathologically very crucial and important phase of disease and provides a chance to halt the progression of disease [10]. According to the various studies as most patients with undifferentiated arthritis develop rheumatoid arthritis, spondyloarthritis, the drug of choice mostly remains methotrexate, sulfasalazine [11]. The objective of this study was to identify the eventual diagnoses of patients presenting with early undifferentiated arthritis.

METHODS & MATERIALS

This prospective observational study was conducted in the Department of Rheumatology, Bangladesh Medical University (BMU) formerly BSMMU, Dhaka, Bangladesh, from September 2020 to March 2022. Adult patients aged 18

years or older presenting to the outpatient and inpatient departments with early inflammatory arthritis were consecutively enrolled and followed at 3 and 6 months. Early undifferentiated arthritis was defined as the presence of at least one swollen or tender joint with symptom duration of one year or less, without fulfilling classification criteria for any specific rheumatic disease at presentation.

The inclusion criteria were age ≥ 18 years, presence of one or more swollen or tender joints, and symptom duration ≤ 1 year. Patients with an established diagnosis of any rheumatic disease at baseline and those with joint swelling or tenderness attributable to trauma or osteoarthritis were excluded. A total of 63 eligible patients were enrolled after obtaining informed written consent; however, 51 patients completed the 6-month follow-up and were included in the final analysis.

Data were collected using a pretested semi-structured questionnaire through face-to-face interviews, clinical examinations,

laboratory investigations, and imaging studies where indicated. Variables assessed included demographic characteristics, clinical manifestations, disease activity, inflammatory markers, rheumatoid factor, anti-cyclic citrullinated peptide antibody, antinuclear antibody, HLA-B27 status, and radiological findings. Disease activity was assessed using the Disease Activity Score-28 (DAS28-CRP) or Ankylosing Spondylitis Disease Activity Score (ASDAS-CRP), as appropriate. Patients were managed according to contemporary recommendations for early arthritis and were monitored for remission, persistence of undifferentiated arthritis, or evolution into a defined rheumatic disease.

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 26. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Logistic regression analysis was performed to identify predictors of persistent

undifferentiated arthritis. A p-value < 0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Review Board of BMU (formerly BSMMU).

RESULTS

A total of 63 patients were included in the study. Among them 51 patients completed 6 months study. 12 patients had loss to follow up due to covid-19 pandemic. 12 patients who had loss to follow up had similar demographic findings as rest of the patients (data not shown). The majority of the participants were female who were 41 in number. The mean age was 38 ± 8.6 years. In our study 24 participants were homemakers by occupation and only 2 patients were unemployed. 7 (13.7%) patients were smoker. Only 1 patient was obese and 19 were overweight. Demographic characteristics of UA patients are shown in *Table I*.

Table I

Demographic Characteristics of Participants (n=51).

Variable	Category	Number (n)	Percentage (%)
Age (years)	Mean $\pm$ SD		38 ± 8.6
Gender	Male	10	19.6
	Female	41	80.4
Education	Up to SSC	20	39.3
	HSC & above	31	60.7
Occupation	Employed	49	96.1
	Unemployed	2	3.9
Smoker	Yes	7	13.7
	No	44	86.3
BMI (kg/m ²)	Mean $\pm$ SD		22.1 ± 3.94
	Underweight	13	25.5
	Normal	18	35.3
	Overweight	19	37.3
	Obese	1	2.0
Comorbidities	Hypertension	9	17.6
	Diabetes	9	17.6
	Thyroid disorder	10	19.6

n = Number, % = Percent, SD = Standard Deviation, BMI: Body Mass Index, SSC: Secondary School Certificate, HSC: Higher Secondary School Certificate.

The mean age at the onset of symptoms was 38.07 ± 8.34 (SD) years. The median duration of symptoms was 120 days (IQR 60-183). 41 patients had predominant upper limb involvement whereas 10 patients had predominant lower limb involvement. In 38 patients the pattern of joint involvement was asymmetrical. The median number of joint involvements was

5 (IQR 3-7) and that of tender joint was 5 (IQR 3-7) at baseline whereas it was 3 (IQR 1-3) and 1 (IQR 1-1) respectively at 6th months. According to the VAS the median of joint pain score was 5 (IQR 5-6) at baseline and at 6th months it was 4 (IQR 4-5). At baseline 38 participants had swollen joint. Of all the patients, 3 (5.8%) had monoarthritis, 26 (50.1%) had

oligoarthritis and 22 (43.1%) had polyarthritis at baseline whereas at the end of 6th months 16 patients had monoarthritis, 19 had oligoarthritis. Morning stiffness was present in 27 patients at baseline but at the end of 6th months only 13 patients had morning stiffness as shown in *Table II*.

Table II
Clinical and Laboratory Characteristics of Participants at Baseline and 6 Months (n=51).

Variable	Baseline	At 6 Months
Age at onset of symptoms (years) †	38.07 ± 8.34	–
Duration of symptoms (days) ‡	120 (60–183)	–
Limb involvement		
Predominant upper limb, n (%)	41 (80.4)	–
Predominant lower limb, n (%)	10 (19.6)	–
Number of joints involved ‡	5 (3–7)	3 (1–5)
Number of tender joints ‡	5 (3–7)	1 (1–1)
Joint pain (VAS, cm) ‡	5 (5–6)	4 (4–5)
DAS-28 CRP ‡	3.96 (3.59–4.15)	2.81 (2.45–3.74)
ASDAS-CRP ‡,*	2.73 (2.52–2.98)	1.96 (1.72–2.08)
Swollen joints, n (%)	38 (60.3)††	14 (27.5)
Arthritis pattern, n (%)		
Monoarthritis	3 (5.8)	16 (31.4)
Oligoarthritis	26 (50.9)	19 (37.3)
Polyarthritis	22 (43.1)	16 (31.4)
Morning stiffness, n (%)	27 (52.9)	13 (25.4)
Back pain, n (%)	12 (23.5)	12 (23.5)
Enthesitis, n (%)	4 (7.8)	–
Oral ulcer, n (%)	5 (9.8)	–
Deformity, n (%)	3 (5.8)	–
ESR (mm 1st hour) ‡	30 (20–40)	15 (10–25)
CRP (mg/L) ‡	9.81 (6.67–14.2)	5.10 (3.01–8.00)

Data expressed as Median (25th percentile–75th percentile), n (%)
a-ASDAS was done for the patients with back pain, ESR-erythrocyte sedimentation rate, CRP-C reactive protein.

In 39 patients who had predominant upper limb involvement with no low back pain disease activity score was calculated using DAS 28 CRP. Among them 2.6% participants had low disease activity, 94.8% had moderate disease activity and 2.6% had high disease activity at baseline. At the end of 6th months 11 patients were in remission, 8 had low disease activity and 20 had moderate disease activity as shown in Table III.

Table III
Disease Activity of Participants with Predominant Upper Limb Involvement at Baseline and 6 Months (n=39*).

Disease Activity Category	At Baseline, n (%)	At 6 Months, n (%)
Remission	0 (0)	11 (28.2)
Low disease activity	1 (2.6)	8 (20.5)
Moderate disease activity	37 (94.8)	20 (51.2)
High disease activity	1 (2.6)	0 (0)

Categorical data expressed as n(%)
*Those who had back pain and predominant lower limb involvement were excluded.

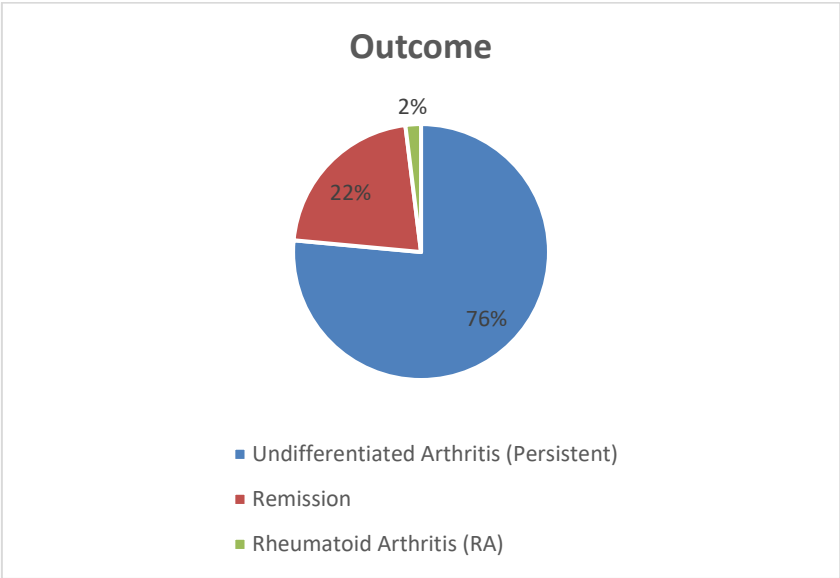


Figure 1: Diagnosis of Patients at the End of the Study (n = 51).

Figure 1 illustrates the diagnostic outcomes of the 51 participants at the 6-month follow-up. The majority of patients, 39 (76.5%), continued to have persistent undifferentiated arthritis, indicating that their condition remained unclassified despite ongoing evaluation. Remission was achieved in 11 patients (21.6%), suggesting a favorable spontaneous resolution of symptoms in a notable subset. Only 1 patient (2.0%) progressed to a confirmed diagnosis of rheumatoid arthritis (RA) by the end of the study period.

Table IV presents the results of logistic regression analysis identifying independent predictors of undifferentiated arthritis among the study participants. Among the nine variables assessed, three factors emerged as statistically significant predictors. A longer duration of symptoms was associated with a protective effect (OR = 0.1, 95% CI: 0.02–0.8, p = 0.02), suggesting that patients presenting with a longer symptom course were less likely to have undifferentiated arthritis. Conversely, a higher number of involved joints significantly increased the odds of

undifferentiated arthritis (OR = 4.7, 95% CI: 1.08–20.9, p = 0.03). Additionally, the number of tender joints showed a significant inverse association (OR = 0.2, 95% CI: 0.05–0.9, p = 0.03). Other variables including age (OR = 1.2, p = 0.5), sex (OR = 0.8, p = 0.7), smoking (OR = 0.6, p = 0.6), pattern of joint involvement (OR = 1.5, p = 0.6), morning stiffness (OR = 1.9, p = 0.3), and swollen joint count (OR = 1.2, p = 0.7) did not reach statistical significance.

Table IV
Logistic Regression Analysis for Independent Predictors of Undifferentiated Arthritis.

Variables	Odds Ratio	95% Confidence Interval		p-value
		Lower Limit	Upper Limit	
Age	1.2	0.6	2.4	0.5
Sex	0.8	0.1	3.6	0.7
Smoking	0.6	0.2	3.9	0.6
Duration	0.1	0.02	0.8	0.02*
Pattern of involvement	1.5	0.2	8.4	0.6
Involvement of joints	4.7	1.08	20.9	0.03*
Morning stiffness	1.9	0.4	8.01	0.3
Tender joint	0.2	0.05	0.9	0.03*
Swollen joint	1.2	0.2	5.7	0.7

*Significant, C. I.=confidence interval.

DISCUSSION

Undifferentiated arthritis is commonly encountered clinical problem. Its presence demand careful consideration in terms of evaluation and management. It can remain undifferentiated for life or can develop into any specific diagnosis. In this study, 63 patients were enrolled. Among them 51 patients completed 6th months follow-up. At the end of the study, one patient was diagnosed as rheumatoid arthritis, thirty-nine patients remained as undifferentiated arthritis and eleven patients went into remission. Thirty-nine patients who were diagnosed as undifferentiated arthritis had persistent disease. Those patients had longer duration of symptoms, higher number of tender joints and involvement of predominant small joints than those who were in remission. The higher number of undifferentiated arthritis is similar to the findings in the study by Haq et al., where 31 cases had undifferentiated arthropathies [5]. This study was done in a Bangladeshi rural community, even though showed substantial number of patients with undifferentiated arthritis. Similarly, Norli et al., had also mentioned the most common final diagnosis to be undifferentiated arthritis in his study [2]. The few available studies of outcome of early undifferentiated arthritis have used different variables for prediction of persistent disease [12]. Green et al., studied predictors of disease outcome at six months in patients with early undifferentiated

arthritis and concluded in his study that the predictors for persistent undifferentiated arthritis were longer disease duration, involvement of small joints of hand and shared epitope [13]. These findings were similar to our study but in our study, genetic tests were not performed. In contrary Harrison et al., in his study found involvement of large joint as one of the predictors for persistence of arthritis. The difference may be explained by our smaller sample size [14]. In this study 11 (22%) patients went into remission at the end of 6th months. The duration of symptoms for less than 6 months, a smaller number of tender joints, swollen joint, morning stiffness for less than 1 hour were common in most patients who went into remission. Wolfe et al., had mentioned shorter symptom duration at presentation, less number of tender joints, swollen joint, few nodules in patients who experienced remission which was quite similar to our findings [15]. Hülsemann et al., 1995 in his study showed complete remission in 54% patients [16]. The relatively high remission rate observed in this study may be partly explained by the use of more aggressive treatment strategies. One patient was diagnosed as rheumatoid arthritis in our study. She was diagnosed on the basis of fulfillment of ACR/EULAR 2010 criteria [17]. This finding varies with different studies where the second common diagnoses after undifferentiated arthritis was rheumatoid arthritis [2]. This variation may be there as most of the selection

criteria in other studies have large focus on patients with extensive joint involvement, with higher proportion of rheumatoid arthritis as a consequence. Furthermore, the relatively short duration of our study may have influenced the observed diagnostic distribution. In this study majority of the participants were female which comprises of 80.4%. In the study done by Bedran et al., the author found female predominance of 74% [18]. Many rheumatological systemic autoimmune diseases affect women more than men [19]. The reason for this overrepresentation of women is not clear but X-linked genetic factors and hormonal aspects are likely to be involved [20]. In this study, the most common presentation in patient with early undifferentiated arthritis was oligoarthritis followed by polyarthritis and monoarthritis. Schumacher et al., reported polyarthritis followed by oligoarthritis and monoarthritis respectively as presenting feature [21]. This may be explained, as earlier various studies focused on including the patients with extensive joint involvement. Majority of patients in our study presented with asymmetrical involvement of upper limbs and small joints. These findings were similar to that of Krabben et al., [22]. More than half of our patients had significant morning stiffness. Similarly, 51% patient had significant morning stiffness in the study by Mjaavatten et al., [23].

This was first ever study done with an attempt to know the full diagnoses in patients presenting with early undifferentiated arthritis and factors predicting persistence of undifferentiated arthritis and specific disease outcome in Bangladesh. Since only one patient was diagnosed as rheumatoid arthritis in this study so predictors of specific disease outcome couldn't be mentioned clearly. However, considering the small sample size and single-centered study design and also the short duration for follow-up, a further larger multicenter study with a long time follow up is recommended to corroborate our research findings.

LIMITATIONS

The study was done in a tertiary level hospital so do not represent the whole population. The time duration for the study was short. The sample size was affected by COVID-19 pandemic and there was loss to follow-up.

CONCLUSION

Undifferentiated arthritis is a commonly encountered clinical problem in the clinical practice. The majority of the undifferentiated arthritis patients remains undifferentiated whereas substantial number of patients are in full remission. The most common specific diagnosis after undifferentiated arthritis is rheumatoid arthritis. Community-based studies are needed to provide more comprehensive and representative data on the spectrum and outcomes of early undifferentiated arthritis. Furthermore, multicenter longitudinal studies with larger sample sizes and longer follow-up periods may help identify reliable predictors of disease evolution and facilitate the development of practical diagnostic and management algorithms. As undifferentiated arthritis may achieve complete remission with timely initiation of appropriate therapy, treatment strategies should be guided by disease severity and prognostic factors rather than diagnosis alone.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Reneses S, Pestana L, Fernández-Suárez A, Criado R, Wichmann I, García A, et al. A recent onset inflammatory polyarthritis register in Spain: factors that predict remission. *Scand J Rheumatol*. 2007;36(6):456-9. doi: 10.1080/03009740701286748.
2. Norli ES, Brinkmann GH, Kvien TK, Bjørneboe O, Haugen AJ, Nygaard H, et al. Diagnostic spectrum and 2-year outcome in a cohort of patients with very early arthritis. *RMD Open*. 2017;3(2):e000573. doi: 10.1136/rmdopen-2017-000573.
3. Mjaavatten MD, Haugen AJ, Helgetveit K, Nygaard H, Sidenvall G, Uhlig T, et al. Pattern of joint involvement and other disease characteristics in 634 patients with arthritis of less than 16 weeks' duration. *J Rheumatol*. 2009;36(7):1401-6. doi: 10.3899/jrheum.081217.
4. Marcos J, Waimann C, Dal Pra F, Hogrefe J, Retamozo S, Caeiro F, et al. General characteristics of an early arthritis cohort in Argentina. *Rheumatology (Oxford)*. 2011;50(1):110-6. doi: 10.1093/rheumatology/keq220.
5. Haq SA, Darmawan J, Islam MN, Ahmed M, Banik SK, Fazlur Rahman AKM, et al. Incidence of musculoskeletal pain and rheumatic disorders in a Bangladeshi rural community: a WHO-APLAR-COPCORD study. *Int J Rheum Dis*. 2008;11(3):241-7. doi: 10.1111/j.1756-185X.2008.00364.x.
6. Shankar S, Dhiman P, Kumar PG. Early undifferentiated arthritis in India: a six month follow up study. *Indian J Rheumatol*. 2010;5(2):64-70. doi: 10.1016/S0973-3698(10)60557-2.
7. Jansen LMA, Van Schaardenburg D, Van Der Horst-Bruinsma IE, Dijkmans BAC. One year outcome of undifferentiated polyarthritis. *Ann Rheum Dis*. 2002;61(8):700-3. doi: 10.1136/ard.61.8.700.
8. Harrison B, Symmons D. Early inflammatory polyarthritis: results from the Norfolk Arthritis Register with a review of the literature. II. Outcome at three years. *Rheumatology (Oxford)*. 2000;39(9):939-49. doi: 10.1093/rheumatology/39.9.939.
9. Van Aken J, Van Dongen H, Le Cessie S, Allaart CF, Breedveld FC, Huizinga TWJ. Comparison of long term outcome of patients with rheumatoid arthritis presenting with undifferentiated arthritis or with rheumatoid arthritis: an observational cohort study. *Ann Rheum Dis*. 2006;65(1):52-6. doi: 10.1136/ard.2005.038471.
10. Heidari B. Undifferentiated arthritis: predictive factors of persistent arthritis and treatment decisions. *Caspian J Intern Med*. 2010;1(3):99-103. PMID: 24523920.
11. Smolen JS. Undifferentiated early inflammatory arthritis in adults. In: *UpToDate*. Waltham (MA): UpToDate; 2018.
12. Jansen AL, van der Horst-Bruinsma I, van Schaardenburg D, van de Stadt RJ, de Koning MH, Dijkmans BAC. Rheumatoid factor and antibodies to cyclic citrullinated peptide differentiate rheumatoid arthritis from undifferentiated polyarthritis in patients with early arthritis. *J Rheumatol*. 2002;29(10):2074-6. PMID: 12375313.
13. Green M, Marzo-Ortega H, McGonagle D, Wakefield R, Proudman S, Conaghan P, et al. Persistence of mild, early inflammatory arthritis: the importance of disease duration, rheumatoid factor, and the shared epitope. *Arthritis Rheum*. 1999;42(10):2184-8. doi: 10.1002/1529-0131(199910)42:10<2184::AID-ANR20>3.0.CO;2-2.
14. Harrison BJ, Symmons DPM, Brennan P, Barrett EM, Silman AJ. Natural remission in inflammatory polyarthritis: issues of definition and prediction. *Br J Rheumatol*. 1996;35(11):1096-100. doi: 10.1093/rheumatology/35.11.1096.
15. Wolfe F, Ross K, Hawley DJ, Roberts FK, Cathey MA. The prognosis of rheumatoid arthritis and undifferentiated polyarthritis syndrome in the clinic: a study of 1141 patients. *J Rheumatol*. 1993;20(12):2005-9. PMID: 8014925.
16. Hülsemann JL, Zeidler H. Undifferentiated arthritis in an early synovitis out-patient clinic. *Clin Exp Rheumatol*. 1995;13(1):37-43. PMID: 7774101.
17. Kay J, Upchurch KS. ACR/EULAR 2010 rheumatoid arthritis classification criteria. *Rheumatology (Oxford)*. 2012;51(Suppl 6):vi5-9. doi: 10.1093/rheumatology/kes279.
18. Bedran Z, Quiroz C, Rosa J, Catoggio LJ, Soriano ER. Validation of a prediction rule for the diagnosis of rheumatoid arthritis in patients with recent onset undifferentiated arthritis. *ISRN Rheumatol*. 2013;2013:548502. doi: 10.1155/2013/548502.
19. van Vollenhoven RF. Sex differences in rheumatoid arthritis: more than meets the eye... *BMC Med*. 2009;7:12. doi: 10.1186/1741-7015-7-12.
20. Cutolo M, Sulli A, Capellino S, Villaggio B, Montagna P, Seriolo B, et al. Sex hormones influence on the immune system: basic and clinical aspects in autoimmunity. *Lupus*. 2004;13(9):635-8. doi: 10.1191/0961203304lu1094oa.
21. Schumacher Jr HR, Habre W, Meador R, Hsia EC. Predictive factors in early arthritis: long-term follow-up. *Semin Arthritis Rheum*. 2004;33(4):264-72. doi: 10.1053/S0049-0172(03)00130-6.
22. Krabben A, Huizinga TWJ, van der Helm-van Mil AHM. Undifferentiated arthritis characteristics and outcomes when applying the 2010 and 1987 criteria for rheumatoid arthritis. *Ann Rheum Dis*. 2012;71(2):238-41. doi: 10.1136/annrheumdis-2011-200205.
23. Mjaavatten MD, Uhlig T, Haugen AJ, Nygaard H, Sidenvall G, Helgetveit K, et al. Positive anti-citrullinated protein antibody status and small joint arthritis are consistent predictors of chronic disease in patients with very early arthritis: results from the NOR-VEAC cohort. *Arthritis Res Ther*. 2009;11(5):R146. doi: 10.1186/ar2820.