

Diagnosis delay in Egyptian rheumatoid-arthritis-patients: underlying factors and outcomes — retrospective observational study

Sarah A. Sakr, Nora Y. Elsaid, Wafaa H. Hssein, Sherif M. Gamal

Rheumatology and Rehabilitation Department, Faculty of Medicine, Cairo University, Cairo, Egypt

ABSTRACT

Background. Early initiation of Rheumatoid Arthritis (RA) treatment leads to better outcomes and low disease activity. In spite of these, there is a significant delay between symptom onset and the initiation of therapy.

Objective. This study aimed to investigate this diagnostic delay and to analyze its associated factors and outcomes.

Patients and method. This cross sectional study included 167 RA patients fulfilling the 2010 American College of Rheumatology/ European League against Rheumatism (ACR/EULAR) classification criteria. All patients were subjected to full clinical, laboratory and radiological assessment and treatment received, also; Disease Activity Score (DAS-28) & functional disability evaluation using Modified Health Assessment Questionnaire (MHAQ) MHAQ were reported. Diagnostic delay was assessed regarding duration, associated factors and outcomes. Furthermore, RA patients were divided into early and late diagnosis group with cutoff of one year and were compared regarding different disease parameters.

Results. The median (IQR) lag in diagnosis of RA patients was 12 months (4 24), MHAQ score was significantly positively correlated with delay in diagnosis ($P=0.02$). Early diagnosis group patients were statistically significantly urban resident ($P= 0.01$), employed ($P= 0.02$), with higher educational level ($P=0.02$), lower functional index MHAQ ($P= 0.02$), and were significantly visiting Rheumatology specialty early in the disease compared to late diagnosis group ($P= <0.0001$).

Conclusion. Early diagnosis is still suboptimal. Unemployment, specialty visited first other than rheumatology, female gender, rural residence, and lower educational level was associated with the delay in diagnosis in RA patients. Patients with delayed diagnosis showed worse functional disability index.

Keywords: rheumatoid arthritis, delay in diagnosis, MHAQ, DAS-28

INTRODUCTION

Rheumatoid arthritis (RA) is an autoimmune inflammatory disease characterized by bilateral symmetric and erosive synovitis [1]. Approximately 1% of the worldwide population has RA with a prevalence of 0.2 in Egypt [2]. The American College of Rheumatology/European League Against Rheumatism (ACR/EULAR) 2010 classification criteria for RA represent an improvement in the identification of early disease [3]. From 2010, studies addressing early RA patients increased dramatically. It was reported

that early treatment initiation in the first 12 weeks from disease onset is effective in controlling disease activity resulting in better outcomes [4]. Early initiation of RA treatment leads to better clinical and radiological status than later initiation; it gives a better chance of achieving sustained remission or very low levels of disease activity. This is due to the early suppression of the inflammation leading to the prevention of the pain, joint destruction and impaired physical function [5].

Corresponding author:
Sarah A. Sakr
E-mail: sarahatefahmed@gmail.com

Article History:
Received: 21 June 2023
Accepted: 29 June 2023

International studies have shown that only between 22% and 31% of patients with RA are assessed by a rheumatologist within 12 weeks of onset of symptoms [6].

The patient's management can be delayed for many causes, including patient delay in presenting to the primary care (PC) physician, delayed referral from PC to a specialist and delay in being assessed by a rheumatologist after the referral [3].

Previous studies showed that many disease related, patient related factors contribute to the early disease diagnosis including male sex, old age at onset, higher education level or income, acute onset and initial small joint involvement [7,8].

We aimed in our study to investigate the demographic and clinical characteristics contributing to diagnostic delay in patients with RA and to estimate the average delay in diagnosis in a cohort of Egyptian RA patients. In addition, we aimed to compare clinical, radiographic, disease activity and functional disability between patients with early and late diagnosis, and to investigate factors associated with such delay.

PATIENTS AND METHODS

This cross sectional study included 167 adult RA patients who were consecutively enrolled in this study, patients were attending Rheumatology department, Cairo university hospital and private Rheumatology centers in Cairo, and fulfilled 2010 ACR/EULAR classification criteria [3].

All patients were subjected to full history taking, thorough clinical examination, routine laboratory investigations, in addition to RF & anti CCP, special emphasis on duration between symptoms onset and RA diagnosis was taken in consideration in history taking. In addition results of x ray both hands and treatment received by patients was recorded. Functional assessment was done by the Modified Health Assessment Questionnaire (MHAQ) [9], and diseases activity was assessed using Disease Activity Score (DAS 28) [10].

Furthermore, RA patients were divided into early and late diagnosis group with cutoff of one year. Patients in early and late group were compared regarding demographics, clinical findings, activity & functional indices, radiologic findings and treatment history.

- **Statistical methods:** Descriptive statistics were done and numerical variables were presented as mean and standard deviation or median and Interquartile range. Categorical variables were presented as frequency and percentages. Comparison between the two independent groups was done using the independent samples t test or Mann Whitney's test as appropriate for the numerical variables.

For the categorical variables, the Chi square test or Fishers exact test were used. P values <0.05 were considered significant. STATA 15.1 was used for the analysis.

Ethical considerations:

This study was approved by the faculty research Ethics Committee (REC) with a registration number (MD-78- 2020). Written informed consent was taken from all the patients, with full freedom to withdraw at any time during the study.

RESULTS

The current study included 167 RA patients; 150 patients were females (89.82%) and 17 were males (10.18%). The mean age of the patients was 44.32± 13.09 years, ranging between 19 -75 years. The demographic data of the patients are represented in Table 1.

TABLE 1. Demographics data of the studied RA patients

Variable	n=167
Age	
Mean ±SD	44.32 ± 13.09
Range	19 -75
Gender Number (%)	
Male	17(10.18%)
Female	150 (89.82%)
Occupation Number (%)	
Not working	119(71.26%)
Working	48 (28.74%)
Residence Number (%)	
Urban	99 (59.28%)
Rural	68 (40.72%)
Income Number (%)	
Low	50(29.94%)
Middle to high	116(69.49%)
Education Number (%)	
Illiterate or primary school	62 (37.12%)
Middle or secondary school	45(26.94%)
University	60 (35.93%)
Family history of RA Number (%)	25(14.97%)
Smoking Number (%)	6 (3.59%)
Age at disease onset (Years)	
Mean ± SD	36.26347 ±12.91
Duration of disease (Years)	
Mean ± SD	7.94± 6.54
Specialty visited first Number (%)	
Orthopedics	127 (76.05%)
Rheumatology	22 (13.17%)
Others	18 (10.78%)
Lag in diagnosis (Months)	
Range	0 -120
Median (IQR)	12 (4- 24)

Regarding disease activity measured by DAS 28, mean \pm SD was 4.69 ± 1.55 . MHAQ median (IQR) was 0.38 (0.125- 1) as shown in Table 2.

TABLE 2. Activity and functional indices of RA patients (n=167)

Variable	n=167
DAS 28	
Mean \pm SD	4.69 \pm 1.55
Interpretation Number (%)	
Remission	17 (10.18%)
Low activity	11 (6.59%)
Moderate activity	75 (44.91%)
High activity	64 (38.32%)
MHAQ	
Median (IQR)	0.38 (0.125 -1)
Interpretation Number (%)	
Normal	77 (46.11%)
Mild	63 (37.72%)
Moderate	15 (8.98%)
Severe	12 (7.19%)

In our patients RF and ACCP were found to be highly positive in (39.52%), (34.73%) respectively, while radiological erosions were found in (41.92%) of the patients, details of laboratory and radiological findings are shown in Table 3.

TABLE 3. Laboratory and radiological findings

Variable	Median (IQR)	Range
ESR	35 (22- 52)	2- 122
Hemoglobin	12 (10.9 -12.9)	8.7- 18
TLC	7 (5.4- 8.6)	3- 18.8
Platelets	265 (230 -344)	137- 521
ALT	20 (14- 26)	6- 288
Creatinine	0.75 (0.6 -0.9)	0.4- 1.9
RF	Number (%)	
Negative	61 (36.53%)	
Low titre	40 (23.95%)	
High titre	66 (39.52%)	
Anti CCP	Number (%)	
Not available	9 (5.39%)	
Negative	71(42.51%)	
Low titre	29(17.37%)	
High titre	58(34.73%)	
Erosions in X ray hand	70 (41.92%)	
Number (%)		
Juxta articular osteopenia in X ray hand	96(57.49%)	
Number (%)		

Review of the medication received by the patients revealed that; 117 patients (70.06%) were on oral steroids, 89 patients (53.29%) were on Methotrexate (MTX), 90 patients (53.9%) were on leflunomide, 32 patients (19.2%) were on combined treatment with MTX and leflunomide. Also, 41 patients (24.5%) were on bDMARDs.

Correlation between disease characteristics and delay in diagnosis revealed that MHAQ score was **significantly positively correlated (P value=0.02)** as shown in Table 4.

TABLE 4. Correlation between disease characteristics and delay in diagnosis in RA

Variable	Coefficient	P value
Age	0.1	0.5
Age at onset	0.1	0.3
Number of joints affected	0.1	0.4
MS duration	0.01	0.9
DAS28	0.11	0.15
MHAQ	0.2	0.02
ESR	0.12	0.1
Hemoglobin	0.12	0.1
Platelets	0.13	0.1

Significant (P value<0.05), highly significant (P value<0.001)

On comparing RA patients diagnosed in less than one year (early diagnosis group) to those diagnosed after one year (late diagnosis group),the early diagnosis group patients were statistically significantly males (**P value=0.01**), urban resident (**P value=0.01**), employed (**P value= 0.02**), with higher educational level (**P value=0.02**), and lower functional index MHAQ (**P value= 0.02**).

Rheumatologists were visited by higher number of patients in early diagnosis group than in late group [20 (25.6%) vs. 2 (2.2%)] with statistically significant difference (**P value= <0.0001**)as shown in Table 5.

TABLE 5. Comparison between RA patients with early versus late diagnosis with cutoff value of 1 year delay

Variable	Early diagnosis (<1 year) (n=78)	Late diagnosis (\geq 1 year) (n=89)	P value
Lag in diagnosis (months)			
Median (Range)	4 (0- 10)	24 (12- 120)	
Age at disease onset			0.3
Median (IQR)	35.5 (28 -48)	34 (25- 44)	

Variable	Early diagnosis (<1 year) (n=78)	Late diagnosis (≥1 year) (n=89)	P value
Gender			
Number (%)			
Male	13 (16.67%)	4 (4.5%)	0.01
Female	65 (83.3%)	85 (95.5%)	
Residence			
Number (%)			
Urban	55 (70.5%)	44 (49.4%)	0.01
Rural	23 (29.5%)	45 (50.6%)	
Occupation			
Number (%)			
Not working	48 (61.5%)	71 (79.8%)	0.02
Working	30 (38.5%)	18 (20.2%)	
Education			
Number (%)			
Illiterate or primary school	19(24.4%)	43(48.3%)	0.02
Middle or secondary school	25(32%)	20(22.5%)	
University	34(43.6%)	26(29.2%)	
Income			
Number (%)			
Low	19 (24.4%)	31 (34.8%)	0.02
Middle to high	59 (75.6%)	57 (64%)	
Specialty visited first			
Number (%)			
Orthopedics	50 (64.1%)	77 (86.5%)	<0.0001
Rheumatology	20 (25.6%)	2 (2.2%)	
Others	8 (10.3%)	10 (11.2%)	
DAS 28 Mean ±SD	4.45 ± 1.54	4.89 ±1.54	0.06
Interpretation			
Number (%)			
Remission			0.2
Low activity	12(15.4%)	5 (5.6%)	
Moderate activity	6 (7.7%)	5 (5.6%)	
High activity	34(43.6%)	41 (46.1%)	
MHAQ			
Median (IQR)	0.25 (0 0.75)	0.5 (0.25 1)	0.02
Interpretation			
Number (%)			
Normal	42(53.8%)	35(39.3%)	0.02
Mild	27(34.6%)	36(40.4%)	
Moderate	2(2.6%)	13(14.6%)	
Severe	7(9%)	5(5.6%)	
Clinical features			
Number of joints affected			
Range	2 26	2 34	0.4
Median	20	22	
MS			
Number (%)	61 (78.2%)	69 (77.5%)	0.9
Duration of MS			
Median (IQR)	30 (10 60)	30 (10 60)	0.8

Variable	Early diagnosis (<1 year) (n=78)	Late diagnosis (≥1 year) (n=89)	P value
Extra articular manifestations			
Number (%)			
	27 (34.6%)	47 (52.8%)	0.3
Comorbidities			
Number (%)			
DM	6 (7.7%)	8(9%)	0.8
CVS	12(15.4%)	18(20.2%)	0.4
Others	13(16.7%)	11(12.4%)	0.4
Imaging			
Number (%)			
Erosions in X ray	29 (37.2%)	41(46.1%)	0.2
Juxta articular osteopenia	40(51.3%)	56 (62.9%)	0.1
Laboratory tests			
Median (IQR)			
ESR	30 (20- 47)	36 (25- 55)	0.1
Hemoglobin	12.15 (11 -13)	11.9 (10.8- 12.7)	0.2
WBCS	7.2 (5.7- 8.9)	6.6 (5.4 8.2)	0.3
Platelets	293.5(235- 357)	260 (228 -310)	0.04
RF			
Number (%)			
Negative	32(41%)	29(32.6%)	0.3
Low titre	15(19.2%)	25(28.1%)	
High titre	31(39.7%)	35(39.3%)	
Anti CCP			
Number (%)			
Not available	6(7.7%)	3(3.4%)	0.7
Negative	32(41%)	39(43.8%)	
Low titre	14(18%)	15(16.8%)	
High titre	26(33.3%)	32(36%)	

Significant (P value<0.05), highly significant (P value<0.001)

DISCUSSION

The first 3 months after the onset of RA symptoms represents an important therapeutic window [7]. Early diagnosis and the initiation of therapy correlate with better outcomes, higher rates of remission, and reduced joint damage [11]. The treatment of RA has been changed dramatically in the past two decades with the introduction of the b DMARDs that resulted in better prognosis of RA patients [12].

In the current study the median (IQR) lag in diagnosis of RA patients in our study was 12 months ranging from zero to 120 months, this was quit longer to the reported median (IQR) lag in diagnosis of 4.8 months (2.4–13) in the study by Luissi and colleagues, (13)

Older study from Egypt display longer delay in diagnosis (24.1 months), (14) similarly long delay was reported in a study from United Arab Emirates (UAE) (30.2±16 months)(15). Another study done in UAE reported a median delay of 11 months until RA patients

first initiated DMARD therapy (16). In Morocco, a study found a delay of 20 weeks before patients were referred to specialists for evaluation (17), while a study from Saudi Arabia showed that patients might not be diagnosed as a case of RA for up to 30 months after the onset of symptoms [15].

Although, shorter delays were found in Europe: 3.17 months in Slovenia [18], 5.25 months in Belgium [19], and four months in Denmark [20]. However, the situation was worse in African countries, in Nigeria, the mean time to presentation to a rheumatologist is 63 months from first symptoms [21]. A study done in Senegal reported that, on average, the time from symptom onset to diagnosis was 54 months [22].

The above mentioned results may indicate that RA management in Middle East and Africa is suboptimal, one of the explanations is that perception of RA in such region is a low priority compared with other more prevalent conditions leading to delayed diagnosis and treatment [23]. Additionally lower resources, deficiency of Rheumatologist in some hospitals and lack of insurance in most African and some Middle East countries may be important contributing factors in such delay.

Regarding specialty visited at the beginning of illness, our study revealed that the number of patients who visited orthopedic specialists was 127 (76.05%) while 22 patients (13.17%) visited rheumatology specialist. This is in line with study conducted by Hussain et al that revealed that orthopedic surgeon were the first consulted physician by 67% of patients [15]. Similarly, Naeem and colleagues reported that initial consultation with rheumatologists was done by 12.7% of patients [24], while in a study done by Rosa and colleagues, the first health professional consulted was a family physician in 31%, internal medicine specialist in 26%, a rheumatologist in 27%, and orthopedic surgeon in 15% of cases [25].

In our study, awareness of patients with rheumatology specialty was reported by 16.77% of patients while in study done by Naeem and colleagues, lack of awareness was found in 50.5% of patients [23].

The positive significant correlation between delay in diagnosis and MHAQ score in our study was similar to Naeem et al [24] but was not proven by Rosa and colleagues [25].

In the current study significantly higher percentage of males was found in early diagnosis group. This may be explained by different help seeking behavior and subjective health complaints between men and women. In addition, it is known that women more frequently seek medical advice with benign non-inflammatory rheumatic syndromes [26]. Also early diagnosis group patients were significantly more highly educated and employed compared to the late diagnosis group, in our opinion, highly educated patients are usually employed with better awareness of their health and medical specialties usually medically insured by their work, all the previously men-

tioned factors may facilitate early seeking for medical advice and early diagnosis. In concordance with our results, Saad and Alhaj reported that delay of 20 months was found with less educated and unemployed patients [27]. Contradictory to our results, Cho and colleagues reported, no statistically significant difference regarding gender and level of education between early and late diagnosis groups [8].

In our study, higher percentage of radiological erosions were detected in late diagnosis group, however the difference between both groups was not statistically significant, the association between delay in diagnosis greater than 12 months and higher radiological damage was reported by other authors [8,25].

Early diagnosis group showed statistically significant lower functional disability score MHAQ, while DAS28 showed no statistically significant difference between both groups. In agreement with our results, Naeem and colleagues reported that patients having diagnostic delay of one year or less were found to have better functional outcome [24], while Cho and colleagues reported that DAS28 ESR and functional disability were not different between the both groups [8].

Though RA was first described in the 18th century, there is still marked delay in its diagnosis especially in the developing countries. It is our duty to spread more awareness among the patients, medical students and other medical specialists to lessen the time from the onset of symptoms to diagnosis and to ensure that RA patients receive the optimum management protocols so they can achieve an adequate disease control during their journey with RA.

CONCLUSION

Early diagnosis is still suboptimal in our cohort. Unemployment, specialty visited first other than rheumatology, female gender, rural residence, lower educational level were associated with the delay in diagnosis in RA patients. Patients with delayed diagnosis showed worse functional disability index in our cohort.

- It is vital for RA and AS patients to seek medical advice with rheumatologists as soon as possible following the onset of symptoms to allow the early introduction of treatment.
- It is crucial to increase awareness of population and medical practitioners of Rheumatic diseases, and the impact of diagnostic delay on a patient's life.
- Further studies including larger number of RA and AS patients may help us more, to study the extent and the impact of diagnostic delay of such diseases in Egyptian RA and AS patients.

Funding Information

The study was performed in Rheumatology Department, Faculty of Medicine, Cairo University, Cairo, Egypt.

Conflict of interest: none declared

REFERENCES

- Zeman MN, Scott PJ. Current imaging strategies in rheumatoid arthritis. *Am J Nucl Med Mol Imaging*. 2012;2(2):174-220. Epub 2012 Mar 28. PMID: 23133812; PMCID: PMC3477730.
- Slimani S, Ladjouze-Rezig A. Prevalence of rheumatoid arthritis in an urban population of Algeria: a prospective study. *Rheumatology (Oxford)*. 2014 Mar;53(3):571-3. doi: 10.1093/rheumatology/ket446. Epub 2014 Jan 13. PMID: 24425779.
- Aletaha D, Neogi T, Silman AJ, Funovits J, Felson DT, Bingham CO, et al. 2010 Rheumatoid arthritis classification criteria: an American College of Rheumatology/European League Against Rheumatism collaborative initiative. *Arthritis Rheum*. 2010 Sep;62(9):2569-81. doi: 10.1002/art.27584. PMID: 20872595.
- Monti S, Montecucco C, Bugatti S, Caporali R. Rheumatoid arthritis treatment: the earlier the better to prevent joint damage. *RMD Open*. 2015 Aug 15;1(Suppl 1):e000057. doi: 10.1136/rmdopen-2015-000057. PMID: 26557378; PMCID: PMC4632152.
- Combe B, Landewe R, Daien CI, Hua C, Aletaha D, Álvaro-Gracia JM, et al. 2016 update of the EULAR recommendations for the management of early arthritis. *Ann Rheum Dis*. 2017 Jun;76(6):948-959. doi: 10.1136/annrheumdis-2016-210602. Epub 2016 Dec 15. PMID: 27979873.
- Raza K, Saber TP, Kvien TK, Tak PP, Gerlag DM. Timing the therapeutic window of opportunity in early rheumatoid arthritis: proposal for definitions of disease duration in clinical trials. *Ann Rheum Dis*. 2012 Dec;71(12):1921-3. doi: 10.1136/annrheumdis-2012-201893. Epub 2012 Aug 31. PMID: 22941769.
- Stack RJ, Nightingale P, Jinks C, Shaw K, Herron-Marx S, Horne R, et al. DELAY study syndicate. Delays between the onset of symptoms and first rheumatology consultation in patients with rheumatoid arthritis in the UK: an observational study. *BMJ Open*. 2019 Mar 4;9(3):e024361. doi: 10.1136/bmjopen-2018-024361. PMID: 30837252; PMCID: PMC6429945.
- Cho SK, Kim D, Won S, Lee J, Choi CB, Choe JY, et al. Factors associated with time to diagnosis from symptom onset in patients with early rheumatoid arthritis. *Korean J Intern Med*. 2019 Jul;34(4):910-916. doi: 10.3904/kjim.2017.113. Epub 2017 Dec 15. PMID: 29232938; PMCID: PMC6610196.
- Maska L, Anderson J, Michaud K. Measures of functional status and quality of life in rheumatoid arthritis: Health Assessment Questionnaire Disability Index (HAQ), Modified Health Assessment Questionnaire (MHAQ), Multidimensional Health Assessment Questionnaire (MDHAQ), Health Assessment Questionnaire II (HAQ-II), Improved Health Assessment Questionnaire (Improved HAQ), and Rheumatoid Arthritis Quality of Life (RAQoL). *Arthritis Care Res (Hoboken)*. 2011 Nov;63 Suppl 11:S4-13. doi: 10.1002/acr.20620. PMID: 22588760.
- Prevoe ML, van 't Hof MA, Kuper HH, van Leeuwen MA, van de Putte LB, et al. Modified disease activity scores that include twenty-eight-joint counts. Development and validation in a prospective longitudinal study of patients with rheumatoid arthritis. *Arthritis Rheum*. 1995 Jan;38(1):44-8. doi: 10.1002/art.1780380107. PMID: 7818570.
- Coffey CM, Crowson CS, Myasoedova E, Matteson EL, Davis JM 3rd. Evidence of Diagnostic and Treatment Delay in Seronegative Rheumatoid Arthritis: Missing the Window of Opportunity. *Mayo Clin Proc*. 2019 Nov;94(11):2241-2248. doi: 10.1016/j.mayocp.2019.05.023. Epub 2019 Oct 13. PMID: 31619364; PMCID: PMC6947665.
- Drosos AA, Pelechas E, Voulgari PV. Treatment strategies are more important than drugs in the management of rheumatoid arthritis. *Clin Rheumatol*. 2020 Apr;39(4):1363-68. doi: 10.1007/s10067-020-05001-x. Epub 2020 Feb 22. PMID: 32088801.
- Luisi A, Rosa JE, Vergara F, Pierini FS, Scolnik M, Garcia MV, et al. AB0194 Journey of a patient with rheumatoid arthritis: delay in diagnosis and treatment. Abst. in: *Ann Rheum Dis*. 2017; 76:P1115. doi: 10.1136/annrheumdis-2017-eular.2967.
- Fathi N, Abda EAM, Salim ZA, Kong K, Badsha H. Rheumatoid arthritis in a cross section of Egyptian patients. *Ann Rheum Dis*. 2009;68(Suppl3):422. [Google Scholar]
- Hussain W, Noorwali A, Janoudi N, Baamer M, Kebbi L, Mansafi H, et al. From Symptoms to Diagnosis: An Observational Study of the Journey of Rheumatoid Arthritis Patients in Saudi Arabia. *Oman Med J*. 2016 Jan;31(1):29-34. doi: 10.5001/omj.2016.06. PMID: 26816566; PMCID: PMC4720936.
- Sokka T, Kautiainen H, Pincus T, Toloza S, da Rocha Castelar Pinheiro G, Lazovskis J, et al. Disparities in rheumatoid arthritis disease activity according to gross domestic product in 25 countries in the QUEST-RA database. *Ann Rheum Dis*. 2009 Nov;68(11):1666-72. doi: 10.1136/ard.2009.109983. Epub 2009 Jul 30. PMID: 19643759; PMCID: PMC2756954.
- Benbouazza K, Benchekroun B, Rkain H, Amine B, Bzami F, Benbrahim L, et al. Profile and course of early rheumatoid arthritis in Morocco: a two-year follow-up study. *BMC Musculoskeletal Disord*. 2011 Nov 23;12:266. doi: 10.1186/1471-2474-12-266. PMID: 22111841; PMCID: PMC3239294.
- Ješe R, Ambrožič A, Gašperšič N, Hočevar A, Lestan B, Plešivčnik Novljan M, et al. AB0238 The Performance of A Single Centre Interventional Clinic in Early Rheumatoid Arthritis: Table 1. *Annals of the Rheumatic Diseases* [Internet]. 2016 Jun;75(Suppl 2):979-2-979. doi: 10.1136/annrheumdis-2016-eular.1679.
- De Cock D, Westhovens R, Joly J, Verschueren P. SAT0454 Determinants of delay between onset of symptoms and initiation of treatment in a belgian RA population: *Annals of the Rheumatic Diseases* [Internet]. 2013 Jun;71(Suppl 3):626.1-626. doi: 10.1136/annrheumdis-2012-eular.3400.
- Sørensen J, Hetland ML; all departments of rheumatology in Denmark. Diagnostic delay in patients with rheumatoid arthritis, psoriatic arthritis and ankylosing spondylitis: results from the Danish nationwide DANBIO registry. *Ann Rheum Dis*. 2015 Mar;74(3):e12. doi: 10.1136/annrheumdis-2013-204867. Epub 2014 Feb 17. PMID: 24534758; PMCID: PMC4345887.
- Adelowo OO, Ojo O, Oduenyi I, Okwara CC. Rheumatoid arthritis among Nigerians: the first 200 patients from a rheumatology clinic. *Clin Rheumatol*. 2010 Jun;29(6):593-7. doi: 10.1007/s10067-009-1355-0. Epub 2010 Jan 22. PMID: 20094746.
- Ndongo S, Lekpa FK, Ka MM, Ndiaye N, Diop TM. Presentation and severity of rheumatoid arthritis at diagnosis in Senegal. *Rheumatology (Oxford)*. 2009 Sep;48(9):1111-3. doi: 10.1093/rheumatology/kep178. Epub 2009 Jul 6. PMID: 19581382.
- El Zorkany B, Alwahshi HA, Hammoudeh M, Al Emadi S, Benitha R, Al Awadhi A, et al. Suboptimal management of rheumatoid arthritis in the Middle East and Africa: could the EULAR recommendations be the start of a solution? *Clin Rheumatol*. 2013 Feb;32(2):151-9. doi: 10.1007/s10067-012-2153-7. Epub 2012 Dec 30. PMID: 23274756.
- Naeem F, Khan SEA, Saeed MA, Farman S. Diagnostic and therapeutic delay in Rheumatoid Arthritis patients: Impact on disease outcome. *Pak J Med Sci*. 2021 Jul-Aug;37(4):1001-7. doi: 10.12669/pjms.37.4.3471. PMID: 34290773; PMCID: PMC8281185.
- Rosa JE, García MV, Luisi A, Pierini F, Sabelli M, Mollerach F, et al. Rheumatoid Arthritis Patient's Journey: Delay in Diagnosis and Treatment. *J Clin Rheumatol*. 2020 Oct;26(7SSuppl2):S148-S152. doi: 10.1097/RHU.0000000000001196. PMID: 31609811.
- Palm Ø, Purinszky E. Women with early rheumatoid arthritis are referred later than men. *Ann Rheum Dis*. 2005 Aug;64(8):1227-8. doi: 10.1136/ard.2004.031716. PMID: 16014684; PMCID: PMC1755586.
- Saad SA, Alhaj NK. Delay in referral of rheumatoid arthritis patients to rheumatology clinic. *Egyptian Rheumatology and Rehabilitation* [Internet]. 2020 Aug 17;47(1). doi: 10.1186/s43166-020-00012-7.