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Diagnostic Delay in Chronic Inflammatory Rheumatic Diseases Presented to the Tertiary Care Rheumatology Unit in PIMS

Alina Fakhar, Shazia Zammurrad, Uzma Rasheed, Muhammad Sufyan Khan

Abstract:

Objective: To quantify the therapeutic and diagnostic delays among patients with CIRDs in Pakistan.

Study Design and Setting: Cross sectional study. PIMS Hospital Islamabad Rheumatology OPD. Duration 8th June 2025 to 8th September 2025.

Methodology: This cross-sectional study comprised 220 patients. Informed consent was obtained; demographic details like age and sex were noted. All Patients previously diagnosed with conditions such as rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, or similar diseases were selected from various rheumatology clinics and departments over six months. Data collection was done using a structured face-to-face interview which included data on demographic information, age of symptom onset, consultation times, and treatment commencement, dividing delays into diagnostic and therapeutic categories. For the analysis in SPSS v21, Shapiro–Wilk, Chi-square, and Fisher's Exact Test were performed, and the results were presented as the median for continuous variables and percentages for categorical data. A p-value = 0.05 was taken as statistically significant.

Results: A total of 220 participants were included in this study. Among the 220 patients, 40.5% had diagnostic delay exceeded 18 months with only 6.4% diagnosed within 6 months. Patients who visited homeopaths had the highest delay rate (56.1%). Psoriatic arthritis (71.4%) and ankylosing spondylitis (53.8%) had longest delays. Joint pain led to early referral in 54.6%, whereas atypical symptoms caused prolonged delays.

Conclusions: The findings of this study revealed that both diagnostic and therapeutic delays are common in CIRDs in Pakistan, often caused by multiple reasons before reaching a rheumatologist and referral system inefficiencies.

Keywords: Ankylosing Spondylitis, Diagnostic Delay, Psoriatic Arthritis, Rheumatoid Arthritis, and Therapeutic

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INTRODUCTION

The CIRDs represent a major challenge for healthcare; they are group of complex autoimmune diseases, including Rheumatoid Arthritis (RA), Psoriatic Arthritis (PsA), Ankylosing Spondylitis (AS), Systemic Lupus Erythematosus (SLE), Inflammatory Bowel Disease-associated Arthritis IBD arthritis, Sjogren's Syndrome, Overlap Syndrome, and MCTD. Diseases under this category characteristically affect the musculoskeletal system in multifaceted ways and have largely been responsible for chronic pain, joint damage, and long-term disability. It usually affects many joints throughout the body at one time but could involve just one joint. Immune cells come into this tissue causing the lining to thicken. These immune cells, along with the cells normally found in the lining, release chemicals that cause the signs of inflammation: swelling, redness and heat. [1,2].

These conditions pose serious health risks and place a significant social and economic strain on patients, families, and the healthcare system. Global health organizations continue to stress the importance of timely diagnosis and treatment in managing CIRDs.

The latest guidelines recommend that patients with suspected disease see a rheumatologist within six weeks of symptom onset to relieve symptoms early and prevent long-term complications.[3] unfortunately, it has generally been difficult to implement this recommendation in LMICs, of which Pakistan is one. This gap in services highlights both the disparity in the access to health care in general and the

Alina Fakhar *(Corresponding Author)*
Fellow Rheumatology, Department of Rheumatology
Pakistan Institute of Medical Science, Islamabad Hospital
Email: dr.alinafakhar@gmail.com

Shazia Zammurrad
Associate Professor, Department of Rheumatology
Pakistan Institute of Medical Science, Islamabad Hospital
Email: shaziazammaurrad@hotmail.com

Uzma Rasheed
Consultant, Department of Rheumatology
Pakistan Institute of Medical Science, Islamabad Hospital
Email: uzma_sheikh@yahoo.com

Muhammad Sufyan Khan
Senior Registrar Department of Rheumatology
Pakistan Institute of Medical Science, Islamabad Hospital
Email: sufyankhan6072@gmail.com

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challenges the specialty of rheumatology still faces.[4]

Diagnostic delays in CIRDs are common and multilevel in Pakistan. First, there is a general lack of awareness about rheumatic diseases and their symptoms in patients. Many persons developing early symptoms may not realize the importance of their symptoms and thus procrastinate seeking professional medical help. Added to this is the system structure itself: for instance, the lack of availability of trained rheumatologists makes timely access to specialty care difficult for many patients. In addition, primary care professionals may be unaware or lack the resources to refer their patients appropriately to specialty care, contributing to further delays.[5,6]

Further, many patients in Pakistan first seek alternative therapies rather than waiting for evidence-based treatment protocols. All this can significantly increase the time to diagnosis and the institution of treatment. Therefore, delays in diagnosis not only enhance disease progression but also increase the social and economic burdens on families and the healthcare system. The cause of such delays would need to be identified and understood. That would hopefully lead the policymakers and healthcare providers toward necessary changes in the way training is imparted, resources are utilized, and policies are framed regarding rheumatologic care.[7,8]

Addressing diagnostic delays in CIRDs assumes significance in light of various studies conducted both internationally and regionally. These highlight the trend toward continued prolongation of time awaiting diagnosis across different healthcare settings. In fact, research from India revealed that patients' diagnostic delay ranged from at least 9 months to as long as 3 years, with considerable variation based on the rheumatic disease a patient suffered from. Such findings only cause difficulties to deal with the complexities of CIRDs.[9,10] However, there is still a significant gap in comprehensive data at the local level regarding the nature and extent of these delays, especially from public-sector tertiary care facilities like our own, the Pakistan Institute of Medical Sciences, in Islamabad. Lack of adequate research impacts the understanding of, and limits our power as healthcare professionals to act on, pressing issues affecting our patient population. Therefore, this study was undertaken with the intention of filling in this gap. Focusing on the referral and diagnostic delays among patients presenting to our Rheumatology Unit, we intend to gather critical baseline data that will help healthcare policymakers to design better interventions at improving the quality of rheumatologic care throughout Pakistan. The process of addressing the challenges posed by CIRDs comprehensively is multilevel: it involves collaboration between health practitioners, educators, policymakers, and the communities concerned. As we continue to gather more evidence and data from our study, we hope to enhance our understanding of these delays and propose best solutions that will bridge the existing gaps in care. In doing so, we will have created a healthcare environment in which individuals with CIRDs can receive timely, effective, and compassionate care, improving their quality of life and reducing burdens on families and society at large.

METHODOLOGY

This cross sectional study took place at the PIMS Hospital Islamabad from 8th June 2025 to 8th September 2025, having received approval from the Institutional Review Board (IRB) under reference number F-5/2024(ERRC)/PIMS. To establish our study parameters, an extensive review of existing literature was performed. From this analysis, we determined a sample size of 220 participants utilizing the World Health Organization (WHO) sample size calculator based on the following assumptions: a 95% confidence level, a 5% margin of error, and an estimated prevalence of rheumatic diseases of 17.3%[11], as reported in prior literature.

Inclusion Criteria: The study included patients aged 18 years and above with a confirmed diagnosis of a chronic inflammatory rheumatic disease, who had experienced symptoms for at least six months before diagnosis, and who consented to participate in the interview process.

Exclusion Criteria: Patients were excluded if they had degenerative or non-inflammatory joint conditions (such as osteoarthritis), incomplete or unclear clinical histories, cognitive impairments affecting memory or communication, or if they were unwilling to participate in the interview.

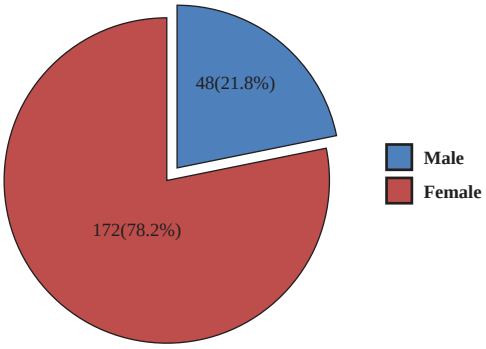
All patients provided written agreement before the enrolment, and their confidentiality was maintained at all levels. The institutional ethics committee's approval was also obtained prior to beginning the study. A total of 220 patients who had already been diagnosed with conditions such as rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, or similar diseases were selected from rheumatology clinics and departments over a period of six months. Information was gathered using face-to-face interviews with each patient, guided by a structured questionnaire prepared specifically for this study. These interviews were conducted by trained staff to maintain uniformity in data collection. The questionnaire included various parts. The first section focused on personal background details such as age, gender, education, and place of residence. The second section inquired the date of first symptom appearance, the time taken to consult a healthcare provider, the number of healthcare professionals consulted prior to final diagnosis, and the duration between the initial consultation and confirmation of the diagnosis. In addition, patients were asked about the interval between diagnosis and the start of specific treatment for CIRDs. This allowed the classification of delays into two major categories: diagnostic delay (time from symptom onset to confirmed diagnosis) and therapeutic delay (time from diagnosis to initiation of appropriate treatment). Both durations were recorded in months for consistency.

Data were analyzed using SPSS version 21. Continuous

Table-1: Baseline Demographic and Clinical Characteristics of the Study Population (n = 220)

	Variables	Median, IQR
	Age	39.00 (32.00-44.00)
		n (%)
Marital Status	Single	32 (14.5%)
	Married	188 (85.5%)
Education Status	No Formal Education	65 (29.5%)
	Primary to Secondary	55 (25.0%)
	Higher Education	100 (45.5%)
Socioeconomic Status	Below 20k	60 (27.3%)
	20,001 to 50,000	128 (58.2%)
	50,001 to 100,00	24 (10.9%)
	100,001 to 200,00	8 (3.6%)
Residence	Rural	75 (34.1%)
	Urban	105 (47.7%)
	Semi Urban	40 (18.2%)
First Symptom	Joint Pains	97 (44.1%)
	Oral Ulcer	27 (12.3%)
	Raynaud's	45 (20.5%)
	Photosensitivity	12 (5.5%)
	Inflammatory back pain	31 (14.1%)
	Rashes	5 (2.3%)
	Neurological signs	3 (1.4%)
Referral Pathway	Hakeem or Homeopathic	66 (30.0%)
	Family Physician	28 (12.7%)
	Medical Specialist	79 (35.9%)
	Orthopedic Surgeon	47 (21.4%)
Setting of First visit	Public	125 (56.8%)
	Private	95 (43.2%)
Initial Symptom to any Physician	Within 6 Months	85 (38.6%)
	6 Months to 12 Months	111 (50.5%)
	12 Months to 18 Months	24 (10.9%)
Initial Symptom to any Rheumatologist	Within 6 Months	17 (7.7%)
	6 Months to 12 Months	54 (24.5%)
	12 Months to 18 Months	74 (33.6%)
	18 Months to 24 Months	56 (25.5%)
	After 24 Months	19 (8.6%)
Diagnostic Delay	= 6 Months	14 (6.4%)
	6 Months to 12 Months	49 (22.3%)
	12 Months to 18 Months	68 (30.9%)
	> 18 months	89 (40.5%)
Final Diagnosis	Ankylosing Spondylitis	39 (17.7%)
	IBD-associated arthritis	3 (1.4%)
	Mixed Connective Tissue Disease	24 (10.9%)
	Overlap Syndrome	8 (3.6%)
	Psoriatic Arthritis	7 (3.2%)
	Rheumatoid Arthritis	69 (31.4%)
	Systemic Lupus Erythematosus	70 (31.8%)

Figure 1: Gender Distribution of Study Population (n=220)



variables, such as age, were assessed for normality using the Shapiro–Wilk test. Since age was not normally distributed, it was summarized as median with interquartile range (IQR). Categorical variables, including gender, marital status, education status, socioeconomic status, residence, first presenting symptom, referral pathway, setting of first visit, diagnostic delay categories, and final diagnosis, were presented as frequencies and percentages. Associations between clinical variables and diagnostic delay as well as referral delay were evaluated using the Chi-square test. Where expected cell counts were less than 5, Fisher's Exact Test was applied to ensure validity of results. All statistical tests were two-tailed, and a p-value = 0.05 was considered statistically significant.

RESULTS

A total of 220 participants were included in this study. Out of the total, 48 (21.8%) were male with the median age of 44.00 (36.50-47.25) years and 172 (78.2%) were female with the median age of 38.00 (31.00-44.00) years. The gender distribution of study population is shown in figure 1.The baseline demographic and clinical characteristics of the study population is shown in Table-I. The association between clinical variables and diagnostic delay in patients with chronic inflammatory rheumatic diseases is shown in Table II. Referral pathway had a strong effect ($p < 0.001$), with the longest delays seen among patients who first visited hakeem or homeopathic practitioners (56.1% had delays >18 months). Those who initially attended public health facilities also experienced significantly longer delays compared to private settings (47.2% vs. 31.6%, $p < 0.001$). The type of first symptom was also significant ($p = 0.018$). Patients presenting with inflammatory back pain (58.1%), rashes (60.0%), and neurological signs (66.7%) had the highest proportion of delays exceeding 18 months, whereas those with joint pains or Raynaud's phenomenon had comparatively shorter delays. Final diagnosis showed a notable association ($p = 0.014$), with psoriatic arthritis (71.4%) and IBD-associated arthritis (66.6%) having the highest rates of prolonged diagnostic delay. Patients with ankylosing spondylitis (53.8%) and overlap syndromes (62.5%) were also commonly delayed, while those with rheumatoid arthritis and systemic lupus erythematosus had relatively earlier diagnoses.

Overall, patients seen first in non-specialist or public settings and those with atypical symptom presentations experienced the greatest diagnostic delays. The association of first symptom and final diagnosis with referral delay is shown in table III. The analysis showed a significant association between first presenting symptom and referral delay ($p < 0.001$). Patients presenting with joint pains were more likely to be referred within 6 months, while those with oral ulcers, Raynaud's phenomenon, photosensitivity, rashes, or neurological signs tended to have longer delays. Similarly, there was a significant association between final diagnosis and referral delay ($p = 0.005$). Rheumatoid arthritis cases were more often referred early, whereas systemic lupus erythematosus, ankylosing spondylitis, and other connective tissue diseases had higher proportions of delayed referrals.

DISCUSSION

Chronic inflammatory rheumatic diseases (CIRDs) affect people across the world by causing rheumatoid arthritis (RA), psoriatic arthritis (PsA), ankylosing spondylitis (AS), systemic lupus erythematosus (SLE), inflammatory bowel disease related arthritis, Sjogren syndrome, and several overlap connective tissue disorders that still burden the populations. Although it is a well-established fact that the most promising policies that could be implemented to avoid the irreversible damages of the joints and organs are early diagnosis and the introduction of disease-modifying treatment, the realization of the aforementioned objectives has been identified as a challenge in low- and middle-income countries (LMICs), including Pakistan. Patient factors, provider factors, and system factors that often cause long delays in referring to specialized rheumatologic care occur in these settings.

The most common diagnoses in this study of 220 patients were SLE (31.8%), RA, (31.4%), AS, (17.7%), mixed connective tissue disease (10.9%), overlap syndromes (3.6%), PsA (3.2%), and IBD-associated arthritis (1.4%). These distributions contrast with most international epidemiological data whereby RA has typically comprised of the highest percentage of autoimmune rheumatic diseases. As an example, a recent international survey showed RA prevalence about 0.5-1% globally, which further confirms its superiority among CIRDs. [12] In the same measure, SLE is generally reported at lower frequencies across the globe with the incidence estimates continuing to be significantly lower compared to what is observed in this tertiary-based cohort.[13]

At relatively similar rates (6.4 vs. 5-8%), AS prevalence in this study coincides with recent multinational data indicating an increasing use of the axial spondyloarthritis concept in clinical practice, which is also consistent with the generally low dermatologic-rheumatologic collaboration pathway in terms of their relative frequency and thus selective presentations.[14] The 14.5% collectively percentage of mixed

Table-2: Association between Clinical Variables and Diagnostic Delay in Patients with Chronic Inflammatory Rheumatic Diseases (n = 220)

Variables		Diagnostic Delay				Total	p-Value
		< 6 Months	6-12 Months	12-18 Months	> 18 months		
Referral Pathway	Hakeem or Homeopathic	4 (6.1%)	16 (24.2%)	9 (13.6%)	37 (56.1%)	66 (30.0%)	<0.001
	Family Physician	2 (7.1%)	2 (7.1%)	12 (42.9%)	12 (42.9%)	28 (12.7%)	
	Medical Specialist	2 (2.5%)	15 (19.0%)	35 (44.3%)	27 (34.2%)	79 (35.9%)	
	Orthopedic Surgeon	6 (12.8%)	16 (34.0%)	12 (25.5%)	13 (27.7%)	47 (21.4%)	
Total		14 (6.4%)	49 (22.3%)	68 (30.9%)	89 (40.5%)	220 (100.0%)	
Setting of First visit	Public	5 (4.0%)	16 (12.8%)	45 (36.0%)	59 (47.2%)	125 (56.8%)	<0.001
	Private	9 (9.5%)	33 (34.5%)	23 (24.2%)	30 (31.6%)	95 (43.2%)	
Total		14 (6.4%)	49 (22.3%)	68 (30.9%)	89 (40.5%)	220 (100.0%)	
First Symptom	Joint Pains	11 (11.3%)	29 (29.9%)	23 (23.7%)	34 (35.1%)	97 (44.1%)	0.018
	Oral Ulcer	0 (0.0%)	3 (11.1%)	15 (55.5%)	9 (33.3%)	27 (12.3%)	
	Raynaud's	0 (0.0%)	12 (26.7%)	16 (35.6%)	17 (37.8%)	45 (20.5%)	
	Photosensitivity	1 (8.3%)	2 (16.7%)	3 (25.0%)	6 (50.0%)	12 (5.5%)	
	Inflammatory back pain	2 (6.5%)	2 (6.5%)	9 (29.0%)	18 (58.1%)	31 (14.1%)	
	Rashes	0 (0.0%)	0 (0.0%)	2 (40.0%)	3 (60.0%)	5 (2.3%)	
	Neurological signs	0 (0.0%)	1 (33.3%)	0 (0.0%)	2 (66.7%)	3 (1.4%)	
Total		14 (6.4%)	49 (22.3%)	68 (30.9%)	89 (40.5%)	220 (100.0%)	
Final Diagnosis	Ankylosing Spondylitis	2 (5.1%)	5 (12.8%)	11 (28.2%)	21 (53.8%)	39 (17.7%)	0.014
	IBD-associated arthritis	0 (0.0%)	0 (0.0%)	1 (33.3%)	3 (66.6%)	3 (1.4%)	
	Mixed Connective Tissue Disease	1 (4.2%)	3 (12.5%)	8 (33.3%)	12 (50.0%)	24 (10.9%)	
	Overlap Syndrome	0 (0.0%)	1 (12.5%)	2 (25.0%)	5 (62.5%)	8 (3.6%)	
	Psoriatic Arthritis	0 (0.0%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	7 (3.2%)	
	Rheumatoid Arthritis	10 (14.4%)	24 (34.8%)	13 (18.8%)	22 (31.9%)	69 (31.4%)	
	Systemic Lupus Erythematosus	1 (1.4%)	16 (22.9%)	31 (44.3%)	22 (31.4%)	70 (31.8%)	
Total		14 (6.4%)	49 (22.3%)	68 (30.9%)	89 (40.5%)	220 (100.0%)	

Table 3: Association of First Symptom and Final Diagnosis with Referral Delay

Variables		Referral Delay			Total	p-Value
		< 6 Months	6-12 Months	12-18 Months		
First Symptom	Joint Pains	53 (54.6%)	38 (39.2%)	6 (6.2%)	97 (44.1%)	<0.001
	Oral Ulcer	6 (22.2%)	16 (59.3%)	5 (18.5%)	27 (12.3%)	
	Raynaud's	11 (24.4%)	32 (71.1%)	2 (4.4%)	45 (20.5%)	
	Photosensitivity	4 (33.3%)	7 (58.3%)	(8.3%)	12 (5.5%)	
	Inflammatory back pain	9 (29.0%)	13 (41.9%)	9 (29.0%)	31 (14.1%)	
	Rashes	1 (20.0%)	3 (60.0%)	1 (20.0%)	5 (2.3%)	
	Neurological signs	1 (33.3%)	2 (66.7%)	1 (33.3%)	3 (1.4%)	
Total		85 (38.6%)	111 (50.5%)	24 (10.9%)	220 (100.0%)	
Final Diagnosis	Ankylosing Spondylitis	11 (28.2%)	19 (48.7%)	9 (23.1%)	39 (17.7%)	0.005
	IBD-associated arthritis	0 (0.0%)	3 (100.0%)	0 (0.0%)	3 (1.4%)	
	Mixed Connective Tissue Disease	10 (41.7%)	12 (50.0%)	2 (8.3%)	24 (10.9%)	
	Overlap Syndrome	2 (25.0%)	5 (62.5%)	1 (12.5%)	8 (3.6%)	
	Psoriatic Arthritis	2 (28.6%)	3 (42.9%)	2 (28.6%)	7 (3.2%)	
	Rheumatoid Arthritis	42 (60.9%)	24 (34.8%)	3 (4.3%)	69 (31.4%)	
	Systemic Lupus Erythematosus	18 (25.7%)	45 (64.3%)	7 (10.0%)	70 (31.8%)	
Total		85 (38.6%)	111 (50.5%)	24 (10.9%)	220 (100.0%)	

connective tissue disease and overlap syndromes is also higher than most international data, and thus may be due to selective referral of complex auto.[15]

There was a high level of diagnostic delay in this study: 40.5 percent of the patients were delayed more than 18 months, whilst only 6.4 percent of the patients managed to get a diagnosis within 6 months as recommended.[16, 17] The delays in these cases are greater than those observed in more recent European studies of early arthritis initiatives, with shorter referral times and early-arthritis clinics significantly shortening diagnostic times. Likewise, these results confirm that diagnostic inefficiencies are present in all areas where there are no established rheumatology pathways.[18, 19]

It has consistently been demonstrated that early diagnosis and DMARDs early start have significant positive effects on outcomes in the long-term across CIRDs. Recent studies have found again that use of DMARD early - even in the first 12 weeks of symptoms - is associated with reduced radiographic progression and improved functional outcome.[20] and similar findings were also found in this data whereby failure to use DMARD early is a significant contributor to morbidity in Pakistan over the long run.

Referral pathways were very important towards delays experienced in this population. Patients who initially used other non-medical providers incurred the longest delays, which is consistent with the regional literature that indicates that early use of non-medical providers is often associated with significant delays in the diagnosis process.[21,22] On top of this, patients who sought the services of the public-sector facilities in the first instance had much longer delays as compared to those who visited the non-medical services, which is indicative of structural constraints, workforce deficits, and long chains of referrals typically reported in LMIC healthcare systems.

Another important determinant was the nature of the first presenting symptom. Prospective referral of patients with classic rheumatologic manifestations, like joint pain, was comparatively earlier whereas; oral ulceration, neurological manifestations, rashes, or Raynaud's phenomenon resulted in a long delay. This has been noted in qualitative European research, where indeterminate or unusual symptoms frequently resulted in repeat assessment by non-experts before they were referred to a specialist. The result of this tendency is that axial spondyloarthritis is regularly mistaken with mechanical back pain in general practice.[23]

The disease-specific analysis revealed that persons with PsA and AS had the highest delayed recognition and systemic referral, which is also in line with recent reports in Turkey, South America, and the COMOSPA initiative, which attribute a high level of delay to low disease awareness, lack of specific biomarkers, and misattribution of symptoms to non-inflammatory diseases.[24] This analysis also indicates that both delay recognition and inefficient use of systems are major challenges in early diagnosis of both diseases.

Taken together, these results highlight the fact that delays in diagnosis are major contributors to poor clinical outcomes and increased economic and social costs. These delays will need a multifaceted intervention related to the health system in Pakistan: educational programs in the population, physician training on primary care, universalized referral protocols, and Better Avenue of access to rheumatologists. Other models demonstrate that organized early-arthritis centers, referral algorithms via the digital, and tele-rheumatology initiatives are capable of eliminating delays in a way that can be used in our study to inform equivalent reforms in Pakistan.

Another aspect that is required is the urgency of national registries and multicenter collaboration to measure diagnostic and treatment delays in a more effective way. Those systems do not only enable policymakers to recognize population-specific barriers, keep track of trends, and assess the effects of interventions. Raising awareness to the general population, reinforcing primary care education, and increasing access to specialists are all crucial ways of increasing patient outcomes and decreasing long-term disability due to CIRDs.

This study had several limitations. It focused solely on one tertiary care hospital, which may limit generalizability to other regions of Pakistan. Data on the onset of symptoms and the dates of consultations were based on the patient's memory, which may have been inaccurate. The study only included patients who went to rheumatology clinics, which could have left out those who were not diagnosed or treated elsewhere. The limitations of the healthcare system, the availability of physicians, and patient health literacy were not thoroughly investigated. Additionally, the sample size was relatively small, and the study did not account for other potential confounding variables. Future research should aim to explore a broader spectrum of contributing risk factors through larger, more comprehensive studies.

CONCLUSIONS

This research indicates a high diagnostic and therapeutic delay in the case of patients with chronic inflammatory rheumatic conditions, such as rheumatoid arthritis, ankylosing spondylitis, and psoriatic arthritis. These delays not only the cause of delay in the initiation of the correct treatment but also result in disease progression, irreversible joint destruction, and reduced quality of life. The results highlight the imperative of raising public and professional awareness for the early signs of these conditions, since diagnosis of diseases to rheumatologists on time can significantly enhance outcomes. Building up primary healthcare systems, equipping general practitioners with the training to recognize early disease markers, enhancing access to specialist services and advanced facilities are key steps in reducing diagnostic delay. In addition, patient education on disease control and early medical consultation should be emphasized. Specialized

research must identify specific delay barriers to early diagnosis and investigate interventions that can decrease delays in different healthcare environments. Early and precise diagnosis with immediate treatment initiation continues to be the guideline for better prognosis and quality of life in rheumatic patients.

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Authors Contribution:
Alina Fakhar: Study design, data collection
Shazia Zammurrad: Literature Review, Data collection, final
Uzma Rasheed: Literature Review, Proof Reading
Muhammad Sufyan Khan: Statistical Analysis

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