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Clinical and Laboratory Profile of Rheumatoid Arthritis Patients at a Highlights from a Study at a Centre in Delhi

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ABSTRACT

Background: Rheumatoid arthritis is an autoimmune disorder that impacts a significant portion of the population. It results in joint damage, pain, and functional impairment, alongside chronic synovitis. This study aimed to elucidate the Clinical and Laboratory Profile of Rheumatoid Arthritis Patients at a Tertiary Care Institute in Delhi.

Methods: This study involved a retrospective analysis of rheumatoid factor measurements performed on 17,130 serum samples at the Serology and Immunology laboratory from June 2021 to July 2024. The SPECTRUM RF Test Kit (Spectrum Medical Industries, Delhi, India) and the SPECTRUM Automatic Analyzer were employed.

Results: Immunoturbidimetry is an uncomplicated and highly sensitive method for the determination of rheumatoid factor. The quantification of rheumatoid factor via immunoturbidimetry is evidently appropriate for routine diagnostic laboratories. Of 17,130 samples, 1,727 tested positive for rheumatoid factor, exhibiting a slight female predominance. A statistically significant relationship (P value < 0.05) with rheumatoid arthritis was identified in all age groups except for 0-10 years. The highest number of positive cases in our study originated from the Department of Orthopedics, followed by Medicine, Pediatrics, Obstetrics and Gynecology, and Surgery.

Conclusion: Rheumatoid arthritis (RA) is a major burden in North India, particularly in Delhi, with gaps in understanding genetic-environmental interactions (e.g., pollution, diet) and the role of rheumatoid factor in asymptomatic/elderly people. Multidisciplinary research is required to create precise diagnostics, risk models, and targeted therapies for this unique situation. Longitudinal studies and region-specific guidelines are critical for improving outcomes and mitigating RA's socioeconomic impact in this population.

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Introduction

Rheumatic diseases are conditions that are not caused by trauma and affect the musculoskeletal system, which includes the bones, soft tissues, and joints. The kidneys, skin, lungs, and neurological system are among the additional organs that these diseases can affect (1-3). The aging process exacerbates the detrimental effects of an immune system that is abnormally active, which is the cause of a significant number of these diseases (4). The most productive members of society, the young people, are hit the hardest by rheumatic diseases. In the general population, rheumatic diseases are a substantial cause of morbidity. Diseases that primarily affect older adults, such as osteoarthritis, are becoming a more prevalent cause of disability and a reduction in quality of life as the population ages (5).

Rheumatoid arthritis (RA) is the most prevalent inflammatory arthritis in clinical practice, with a global prevalence of 0.5-1% (6-7). According to reports, the prevalence of this condition in India ranges from 0.28 to 0.7% (8). The American College of Rheumatology/European League Against Rheumatism (ACR/EULAR) classification criteria for RA have included rheumatoid factor (RF) and anticitrullinated protein antibodies (ACPA) as serological hallmarks of the disease (9).

It leads to persistent synovitis, pain, damage to joints, and loss of function. Early detection of rheumatoid arthritis is important because damage to joints that can't be fixed can be stopped in the first few months of the disease (10-12). Rheumatoid factor is an antibody that targets the Fc part of IgG. It is used to confirm that someone has rheumatoid arthritis. However, it is not specific and can happen to older people who are healthy or who have other autoimmune or infectious diseases (13).

The early diagnosis of rheumatoid arthritis is crucial because aggressive therapy can avert the development of articular erosions and deformities. A poor prognosis has been linked to a high titer of rheumatoid factor, as measured by conventional agglutination tests, in rheumatoid arthritis, including extra-articular manifestations such as vasculitis and rheumatoid nodules (14, 15).

At present, there are numerous methods available for measuring the rheumatoid factor. Methods such as the latex agglutination test are only semi-quantitative and necessitate a subjective interpretation of the end point. Furthermore, this approach is constrained by the requirement that the rheumatoid factor level must alter by more than 50% prior to a corresponding change in titer. Elisa methods have recently become accessible for the purpose of measuring the rheumatoid factor in absolute terms. They are extremely sensitive, but they are also relatively expensive and time-consuming.

Another simple and sensitive technique for rheumatoid factor determination is immunoturbidimetry. It is based on quantifying the extent of light scatter resulting from the interaction between rheumatoid factor and latex particles (16). Our study examines the demographic characteristics of patients with rheumatoid arthritis within the North-Indian population.

Materials and Methods

This retrospective study analysed rheumatoid factor levels in 17,130 serum samples processed at the Serology and Immunology Laboratory, Department of Microbiology, University College of Medical Sciences and GTB Hospital, Delhi from June 2021 through July 2024.

Serum Separation: Venous blood samples (3-5 mL) were collected in plain vacutainers and allowed to clot for 30 minutes at room temperature prior to centrifugation at 2000 rpm for 10 minutes. The resulting supernatant serum was aliquoted and stored at -20 °C until analysis.

Serum rheumatoid factor levels were determined by immunoturbidimetry using the spectrum RF Test Kit processed on the spectrum Automatic

Analyzer (Spectrum Medical Industries, Delhi). The analysis included daily calibration with manufacturer-provided standards and three-level quality controls run in parallel with patient samples.

Statistical Analysis

Data were recorded in Microsoft Excel (Microsoft Corporation, Redmond, WA) and analysed using SPSS version 21.0 (IBM Corporation, Armonk, NY) following standard statistical protocols.

Results

Outpatient samples accounted for 13317(77.74%) of the total 17130 samples tested for rheumatoid factor estimation, while inpatient samples accounted for 3813 (22.25%). Out of a total of 17,130 samples, there were 1,727 positive samples and 15,403 negative samples for rheumatoid factor. Of the 1727 samples that tested positive, 1080 were female and 647 were male, with males accounting for 37.36% of the total positive population. Among the 1727 confirmed cases, the distribution by age was as follows: 0–10 years-119 (6.89%), 11–20 years-128 (7.41%), 21–30 years-158 (9.15%), 31–40 years-218 (12.62%), 41–50 years-394 (22.81%), 51–60 years-353 (20.44%) and over 60 years-357 (20.67%) as in figure 1.

In figure 2, out of 9989 cases, 843 were positive in the Orthopedics Department, while 618 were positive in the Medicine Department out of 5902. Similarly, out of 884 cases in the pediatrics department, 148 were positive, and out of 105 cases in the obstetrics and gynecology department, 28 were positive. In the Department of Surgery, 27 out of 102 cases tested positive for rheumatoid factor. The dermatology department had 39 positive cases out of 74, the psychiatry department had 9 out of 37, and the miscellaneous had 15 out of 40.

Table 1 displays the distribution of the total number of cases tested according to age. In the 0-10 age group, out of 723 cases, 119 tested positive for rheumatoid factor. There were 128 positive cases out of 1,156 in the 11–20 age group, 158 positive cases out of 1943 in the 21–30 age group, 218 positive cases out of 6351 in the 31–40 age group, 394 positive cases out of 2,679 in the 41–50 age group, and 353 positive cases out of 2,406 in the 51–60 age group.

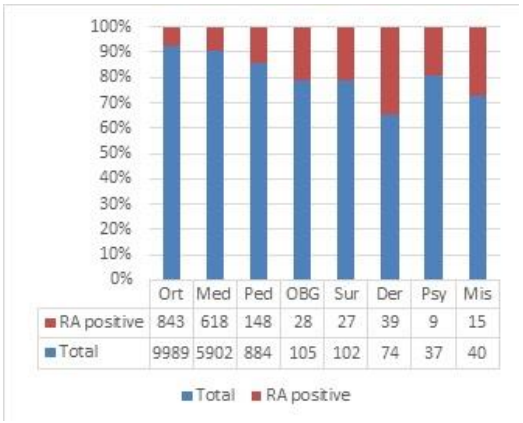

Figure 1. Department-wise distribution.

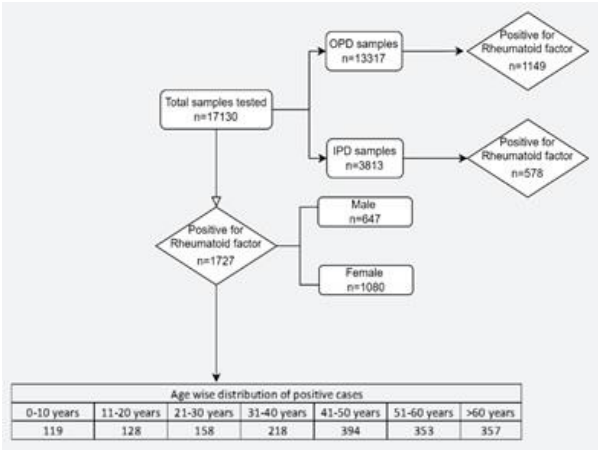

Figure 2. Flow chart of total samples tested, opd & ipd gender, male & female, age distribution.

Table 1. Details of collected samples.

Age group	Rheumatoid factor Positive n=1727 (%)		Rheumatoid factor Negative n=15403 (%)		Total n= 17130 (%)		P- value
0-10yr	119	6.89%	604	3.92%	723	4.22%	0.1237
11-20yr	128	7.41%	1028	6.67%	1156	6.75%	<0.0001
21-30yr	158	9.15%	1785	11.59%	1943	11.34%	<0.0001
31-40yr	218	12.62%	6133	39.82%	6351	37.08%	<0.0001
41-50yr	394	22.81%	2285	14.83%	2679	15.64%	0.0001
51-60yr	353	20.44%	2053	13.33%	2406	14.05%	0.0001
>60yr	357	20.67%	1515	9.84%	1872	10.93%	

Of the 1872 cases, 357 were found in individuals older than 60 years. We observed a statistically significant relationship (P value < 0.05) between all age groups, with the exception of the 0-10 years age group, when using individuals older than 60 years as a reference (non-exposed) group. 148 positive cases out of 884 were in children (age less than 13 years), not shown in the table having P value 0.1405.

Discussion

Rheumatoid factor is a protein synthesized by the immune system that can target and damage healthy tissues in the body. Elevated concentrations of rheumatoid factor in the bloodstream are predominantly linked to several autoimmune disorders, such as rheumatoid arthritis and Sjogren's syndrome. Rheumatoid factor may be present in certain healthy individuals and in some patients with autoimmune disorders, where normal levels of rheumatoid factor have also been observed. The presence, absence, and elevated levels of rheumatoid factor significantly influence the diagnosis and prognosis of rheumatoid arthritis. Seropositive patients (rheumatoid factor positive) with rheumatoid arthritis may encounter more severe and erosive joint disease, as well as extra-articular manifestations like rheumatoid nodules and vasculitis, compared to seronegative patients (rheumatoid factor negative) (17).

By immunoturbidimetry method, the quantification of rheumatoid factor appears to be well suited for the routine diagnostic laboratory. Additionally, immunoturbidimetry has several advantages in comparison to the more traditional agglutination tests. The immunoturbidimetry test is straightforward, provides results in a short amount of time, possesses a high degree of precision, and in addition, it is able to measure rheumatoid factor in absolute terms.

Rheumatoid factor, an antibody typically associated with rheumatoid arthritis, is detectable in 5-15% of healthy individuals, with prevalence increasing to 10% or more in those aged 65+ (18-21). This age-related rise likely reflects natural immune system changes (immunosenescence), chronic low-grade inflammation, and cumulative environmental exposures. Our findings of 10% RF positivity in asymptomatic individuals align with these patterns, suggesting that RF detection in elderly patients may represent an age-related phenomenon rather than early RA. While valuable for RA diagnosis, RF's presence in healthy populations highlights the need for cautious interpretation, particularly in older adults.

Our study identified a greater prevalence of rheumatoid arthritis in Indian women than in men (F vs. M = 1.66). Several studies, including those by Wallenius et al., Sokka et al., Hallert et al., and

Forslind et al., indicate a higher prevalence of rheumatoid arthritis in females compared to males (22-25). Cross-sectional studies in Latin American nations also indicated a female predominance (26). In a study involving Algerian patients, Ouali et al. reported that the majority of positive cases were females, aligning with our findings, and the same may be ascribed to the influence of sex hormones on the immune system (27-28).

Our study found increase in the prevalence of rheumatoid arthritis in <13-years old children, despite the fact that this condition primarily affects adults which relects the role of geoecological factors. Therefore, in order to help identify the potential triggers, it is necessary to continue monitoring new cases in younger age groups. Consistent with our findings, Al Mayouf et al. found that rheumatoid arthritis is more common in children under the age of 16 (29). another study conducted in USA in children population found that RA is associated with the children having breast feed less than 3 months (30).

Conclusion

Multidisciplinary research is needed to refine diagnosis, improve risk prediction, and develop region-specific therapies to enhance outcomes and reduce the disease's socioeconomic impact.

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Ethics approval and consent to participate

Not applicable.

Conflict of interest

None declared.

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