RESEARCH

Rheumatology training and awareness among undergraduates in Indian medical schools: a multicenter observational study

Deepti Agarwal¹, Kavita Krishna¹, Srilakshmi Sathiyaseelan¹ and Sandeep Kansurkar^{1*}

Abstract

Background Rheumatic and musculoskeletal diseases, which are prevalent in nearly 25–30% of the Indian population, pose a significant burden on public health. However, the field is often overlooked in undergraduate medical curricula, leading to a shortage of adequately trained healthcare professionals to address these conditions, especially at the primary health care level. Enhancing rheumatology training for undergraduates in India is imperative. Symptoms of rheumatological diseases are nonspecific and often overlap with those of degenerative joint diseases, neurological conditions, vascular issues, and dermatological problems. As a result, early diagnosis is challenging. A lack of knowledge and skills results in delayed diagnosis and leads to long-term disability and reduced quality of life for patients. Adequate training at the undergraduate level can facilitate early detection and management. At present, rheumatology is taught as part of the internal medicine curriculum through lectures and training during clinical ward postings. We conducted this study to assess the awareness and knowledge of rheumatological diseases among final-year undergraduate medical students and interns.

Methods This was a questionnaire-based cross-sectional study. The anonymized, self-administered, semi structured questionnaire with 9 questions across various domains was designed to gauge participants' exposure to rheumatological illnesses during undergraduate training. Questions 1 and 2 pertained to their duration of training in Medicine and Orthopedics. Question 3 addressed the perceived prevalence of rheumatological complaints, 5, and 6 focused on the cases encountered during clinical rotation, the approach to rheumatological complaints, and joint examination, respectively. Question 7 aimed to assess the difficulties in learning rheumatology. Question 8 provided an objective evaluation of knowledge using 12 true/false questions and a score 65% or more was deemed satisfactory. Question 9 was designed to gauge their confidence regarding rheumatological conditions compared to other conditions. The questionnaire was administered to both undergraduates (UGs) and those undergoing internship (Interns).

Results A survey of 459 students revealed that the students frequently encountered patients with rheumatoid arthritis (83.5%), osteoarthritis (66.9%) and gout (55.4%) where as less encountered conditions were dermatomyositis (6.6%, 26/390), Sjogren syndrome, antiphospholipid antibody syndrome, and systemic sclerosis (7.9%, 31/390). They remembered being taught to examine large joints, mostly the knee joint (68.2%) whereas less emphasis was placed

*Correspondence: Sandeep Kansurkar sandeepkansurkar@gmail.com

Full list of author information is available at the end of the article



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on the small joints of the hands (34.5%, 127/368), feet (22.5%, 83/368), and ankles (29.8%, 110/368). Only 20% students scored more than 65% in the knowledge score. There was a significant lack of confidence for rheumatological conditions when compared with other conditions (P < 0.001). Interns performed better than final-year students in terms of knowledge confidence level of Rheumatological conditions (P < 0.001).

Conclusion This study highlights a significant knowledge gap about musculoskeletal conditions among students, with interns showing greater confidence than final-year students. The confidence in examining rheumatological conditions was lower than other conditions indicating inadequate training. These findings suggest revising medical curricula to include more comprehensive teaching in rheumatology and practical training in joint examination. Addressing these gaps is crucial for improving medical education and patient care.

Keywords Rheumatology, Medical education, Survey, Competency based medical education

Background

Musculoskeletal disorders (MSKDs) and Autoimmune Rheumatic Disorders (AIRDs) are the second most common cause of years lived with disability (YLD), and their burden is ever increasing. The Global Burden of Disease Survey 2019 revealed a 59% increase in the incidence of five common musculoskeletal disorders (rheumatoid arthritis, osteoarthritis, low back pain, neck pain, and gout) and a 123% increase in the incidence of other MSK diseases, such as systemic lupus erythematosus (SLE), vasculitis, and fibromyalgia [1]. The chronic pain and disability associated with these conditions not only reduce the quality of life for patients but also lead to substantial economic costs due to lost productivity and increased healthcare expenditures [2].

Primary care doctors, who generally handle patients first in the community, need to be conversant in identifying common MSKDs and AIRDs. However, it has been observed that they often lack the necessary skill set [3]. This gap in knowledge and expertise is particularly alarming given the rising prevalence of these conditions. Early and accurate diagnosis of rheumatic diseases is often required for effective management. Delays or inaccuracies can lead to worsening outcomes for patients [4].

In India, the situation is particularly bad due to the increasing prevalence of musculoskeletal and autoimmune disorders. The healthcare system is already strained, and the additional burden of these chronic conditions exacerbates the challenge [5]. It is essential to improve awareness and education about rheumatic diseases among undergraduate medical students, who are often the first contact physicians in the community. By equipping future doctors with the necessary knowledge and skills to recognize and manage these conditions, we can improve patient outcomes and reduce the overall burden on the healthcare system.

Modern medical education and training system in India date back to 19th century. The current undergraduate degree, Bachelor of Medicine and Bachelor of Surgery (MBBS), consists of four and a half years of training in various clinical and basic subjects, followed by a one-year compulsory rotating internship. The internship year involves rotations in specialties such as medicine and allied subjects, surgery, orthopedics, obstetrics and gynecology, and community medicine. Over the years, medical education in India has evolved, expanded and continues to do so, with increasing specialization and superspecialization training. However, rheumatology has not been emphasized significantly in the Indian undergraduate medical education system. The National Medical Council (NMC) implemented the transformative Competency-Based Medical Education (CBME) curriculum for MBBS batches admitted from August 2019 onward. This curriculum places greater importance on rheumatological conditions. There are 27 competencies related to rheumatology, but common and useful rheumatological procedures, such as synovial fluid aspiration and intra-articular steroid injection, are still not part of the curriculum and are not required for successful internship completion. Furthermore, MSKDs and AIRDs are not given due importance during the final year of medicine or orthopedic examinations [6]. There remains a significant gap in research evaluating the impact of this new curriculum on rheumatology training for undergraduate medical students.

The primary objective of this study is to evaluate the awareness and knowledge of rheumatology among final-year medical students and interns trained under the Competency-Based Medical Education (CBME) curriculum in India. By identifying gaps in their education, this study aims to highlight areas where the medical curriculum could be improved to better prepare future physicians for diagnosing and managing these increasingly prevalent conditions.

Methodology

Survey designing

This was a questionnaire-based cross-sectional study. Since there were no pre-existing questionnaires to assess the knowledge and awareness of medical students in Rheumatology, a new questionnaire was designed specifically for this purpose. The anonymized, self-administered, semi-structured questionnaire consisted of nine questions across various domains (Fig. 1 and Supplementary document).

Name, Emails and institution names were anonymized to ensure free answers. These questions were designed to gauge participants' exposure to MSKDs and AIRDs and the knowledge acquired during undergraduate training about it. The questionnaire consisted of questions in both subjective and objective domains for assessing awareness of rheumatology. It was administered to final year undergraduates (UG) and same was also offered to those undergoing internship (Intern). Questions 1 and 2 pertained to their duration of training in Medicine and Orthopedics. Question 3 focused on the perceived prevalence of rheumatic diseases. Questions 4, 5, and 6 concerned the cases encountered during clinical rotation, approach to complaints, and joint examination, respectively. Question 7 aimed to assess the difficulties in learning rheumatology.

To the best of our knowledge, there are no previously validated scoring systems for assessing the knowledge of rheumatology among undergraduate. Hence, we designed an objective question set (Question 8) to assess students' knowledge. This question included 12 true or false sub questions. Binary questions were used for simplicity. The 12 questions covered practical aspects of rheumatology, and knowledge of these aspects was

(Please Tick) Rheumatoid arthritis	/) Dermatomy	ositis	Fibromyalgia	-
Osteoarthritis	Sarcoidosis		Gout	
SLE	Antiphosphe	alipid syndrome	Spondyloarthritis	
Systemic sclerosis	Sjogren's sy	ndrome		
6. Examination	of which joints has been	demonstrated?(F	Please tick √)	
Shoulder	Small joints of hands		Ankie	
Elbow	Нір		Small joints of foot	
Wrist	Knoe			

Page 3 of 9

deemed essential for an undergraduate student. For example, they were questioned about their knowledge about the usage and side effects of methotrexate and the utility of glucocorticoids in treating osteoarthritis and other similar fashion questions. The answers were scored per student, resulting in a "knowledge score." As the questions were binary in nature, with a toss probability of 50%, the minimum expected knowledge score to be deemed satisfactory was 65% (8/12).

Question 9 comprised 13 sub questions aimed at gauging students' confidence levels in rheumatology (RH) and other systems(OTH) like cardiology, neurology and pulmonology. Nine sub questions were related to rheumatology, and four were regarding other specialties. The confidence in rheumatology (RH) was calculated as the average confidence level across the nine rheumatology sub questions, while the confidence in other subjects (OTH) was calculated as the average across the four other specialty sub questions.

An independent team of three rheumatology consultants and two fellows in training reviewed the questions for their content and validity. The first draft was scrutinized for grammatical errors, relevance and suitability. Pilot testing was done in five UG students and they could complete the survey within ten minutes and there were no major concerns regarding clarity or comprehension of the questionnaire.

Sr. No	Question	Yes	No
1	Rheumatic fever and rheumatoid arthritis are associated	Yes	No
2	Osteoarthritis can be treated with DMARDs	Yes	No
3	All arthritis patients need to be referred to orthopaedics	Yes	No
4	Giving corticosteroids is the best way to treat rheumatology patients	Yes	No
5	Methotrexate is a dangerous drug even with frequent monitoring	Yes	No
6	Joint pain is seen in all rheumatic diseases	Yes	No
7	Antinuclear antibodies (ANA) can be positive in normal persons	Yes	No
8	Most of the rheumatological diseases do not have family history	Yes	No
9	Increased uric acid needs to be lowered even in asymptomatic patients	Yes	No
10	Self limiting conditions in rheumatic conditions are rare	Yes	No
11	RA factor level needs to be repeated for treatment monitoring	Yes	No
12	Increased joint mobility can cause joint pain	Yes	No

9. What is your level of confidence in (rate it from level 1 to level 10)

Examination	Confidence (Rate 1 to 10)
Differentiating pleural effusion from consolidation	
Differentiating mitral stenosis from mitral regurgitation	
Differentiating Upper motor neuron lesion from lower motor neuron lesion	
Examination of gait	
Differentiating inflammatory and non inflammatory arthritis	
Differentiating mechanical low backache and inflammatory back ache	
Differentiating primary from secondary Raynaud's phenomenon	
Differentiating articular from periarticular pain	
Plan investigations as per type of arthritis	
Measurement of disease activity in rheumatoid arthritis	
Measurement of pain	
Identifying sacroiliitis on X ray	
Identifying erosions on Xray	

Sampling strategy and data handling

The initial part of the questionnaire included an introduction to the survey team, the purpose of the survey, consent for participation and publication, and details on the data anonymization process.

The questionnaire was distributed in both print and digital formats (via Google Forms) to six medical colleges across different regions of India. It was circulated among 975 medical students, and responses obtained within one month were included. Periodic reminders were sent during this month via emails and WhatsApp messages. Prior to commencement, institutional ethics approval was secured, and informed consent was obtained from all participants.

Sample size was calculated, assuming the population proportion of 50%, with confidence level of 95% and margin of error of 5% and the sample size determined was 385. Any sample size above this was considered adequate. Excess students were recruited to compensate for incomplete data, if any.

Statistical analysis

Data analysis was performed using Microsoft Excel and SPSS version 24. Continuous variables were summarized and presented as the means and standard deviations, while categorical variables were summarized as percentages and frequencies. Intergroup comparisons for confidence levels and knowledge scores were performed using Analysis of variance (ANOVA), post hoc analysis was performed, and confidence between groups was compared using an independent t test.

Table 1 Demogra	phics
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Variables	Frequency
	(%)
Mean Age ± SD	22.5±1.35
Gender (n=459)	
Males	218 (47.5%)
Females	241 (52.5%)
Year of Study (n = 459)	
Final Year	267 (58.2%)
Interns	192 (41.8%)
Months of clinical rotation in Medicine (n = 459)	
2 months	94 (20.5%)
3 months	98 (21.4%)
>3 months	267 (58.2%)
Months of Clinical Rotation in Orthopedics (n = 459)	
None	48 (10.4%)
<1 month	33 (7.2%)
1-2months	298 (64.9%)
2 months and above	80 (17.4%)

Results

Respondent characteristics

A total of 975 medical students of six medical colleges were offered to participate in the study and out of this 459 students (47.02%) responded. A total of 222 responses were collected digitally and 237 via printed questionnaires. Despite some incomplete forms, all were included in the analysis. Of the 459 respondents, 241 were female and 218 were male. The mean age of the participants in the study cohort was 22.5 ± 1.35) years. Among them, 267 were final-year undergraduates (UGs), and 192 were interns. Questions 1 and 2 concerned the duration of training in medicine and orthopedics; most students (58.2%) had completed three months or more of general medicine rotation, and 64.9% had one to two months of orthopedic rotation (Table 1).

Awareness about common rheumatological conditions, symptomatology and examination

Regarding the perceived prevalence of rheumatic diseases (Question 3), a significant number (38.9%) estimated that the prevalence of musculoskeletal illnesses was between 20% and 40%. The results for guestions 4, 5 and 6 are summarized in Table 2. Responses regarding awareness of common rheumatological diseases (Question 4) indicated that rheumatoid arthritis was the most frequently encountered condition (83.5%, 326/390), followed by osteoarthritis (66.9%, 261/390) and gouty arthritis (55.4%, 216/390). Among the diseases listed, the least common were dermatomyositis (6.6%, 26/390), Sjogren syndrome, antiphospholipid antibody syndrome, and systemic sclerosis (7.9%, 31/390) (Table 2). When questioned about the approach to various rheumatological complaints (Question 5), 403 out of 459 participants registered their responses. Half of the students remembered being taught about generalized body pain (51.1%, 206/403) and uveitis (47.4%, 191/403). Conditions such as dactylitis (7.19%, 29/403) and monoarthritis (19.1%, 77/403) were taught less commonly (Table 2).

Regarding joint examination (Question 6), knee joint examination was mentioned by the majority (68.2%, 251/368) as the most commonly taught, whereas less emphasis was placed on the small joints of the hands (34.5%, 127/368), feet (22.5%, 83/368), and ankles (29.8%, 110/368) (Table 2).

Hurdles in rheumatology learning

Question 7 regarding to the difficulty in learning rheumatology, and over half of the students (54.48%, 237/435) cited inadequate training in musculoskeletal examination as the most challenging aspect of learning rheumatology (Table 2).

 Table 2
 Summary of responses to questions 3,4,5,6,7

Variables	Frequen- cy (%)
Q3. Perceived Prevalence of MSK diseases (%) (n = 459)	
<10	30 (6.91)
10–20	74 (17)
20–40	169 (38.9)
40–60	88 (20.2)
Q4. What are the Rheumatology cases you have en-	
Phoumatoid Arthritic	276 (02 5)
	261 (66 0)
Cout	201 (00.9)
	124 (24 2)
Sarcoidosis	194 (94.9)
Fibromyalaja	38 (0.7)
Systemic Sclerosis	31 (7 9)
Antiphospholinid Syndrome	31 (7.9)
Siggren Syndrome	31 (7.9)
Dermatomyositis	26 (6.6)
05. Approach to Which of the following complaints is	20 (0.0)
discussed in your clinics (n = 403)	
Generalized Body Pain	206 (51.1)
Uveitis	191 (47.4)
Polyarthritis	169 (41.9)
Low Backache	153 (37.9)
Joint Deformities	142 (35.2)
Raynaud's Phenomenon	141 (34.9)
Proximal Muscle Weakness	81 (20.1)
Monoarthritis	77 (19.1)
Dactylitis	29 (7.19)
Q6. Examination of Which of the joints has been dem- onstrated ($n = 368$)	
Knee	251 (68.2)
Shoulder	202 (54.9)
Нір	169 (45.9)
Elbow	140 (38.1)
Wrist	133 (36.1)
Small joints of Hand	127 (34.5)
Ankle	110 (29.8)
Small joints of foot	83 (22.5)
Q7. What is the most difficult aspect in learning Rheumatology ($n = 435$)	
Inacology (II – 433)	237(51 1Q)
	167(38 30)
Complex Nature of Basic Immunology	126(28.96)
Not given importance in exam oriented preparation	122(28.04)

Knowledge in rheumatology and confidence level in RH and OTH

Analysis of question 8 showed, only 20% students (91/459) could score more than 65% in the "Knowledge Score".

When responses in UG and Intern group were compared there was a significant difference in knowledge score (p < 0.01). The mean confidence level for RH and OTH was also significantly better in Intern group than UG group (Fig. 2; Table 3).

Also, it was seen that overall among all participants the confidence for RH (3.69 \pm 2.06) was significantly lower than OTH (4.69 \pm 2.22) (Fig. 3). Results of this study are summarised in visual abstract (Fig. 4).

Discussion

This study was conducted to assess the overall awareness of rheumatological illnesses among outgoing medical undergraduate students who frequently serve as primary healthcare providers for the general population after graduation.

The results revealed significant lacunae in the awareness and knowledge of rheumatological illnesses among the participants. The perceived prevalence of rheumatological illnesses in the community by the students was 20-40%, which aligns with the actual community prevalence of rheumatological diseases in India [5]. However, their exposure to and awareness of commonly encountered rheumatological illnesses, such as Sjogren syndrome, were notably low. Students were more likely to be familiar with rheumatoid arthritis, osteoarthritis, and gout. Students also had limited exposure to rheumatologically important symptoms such as dactylitis and monoarthritis. One notable finding was the greater percentage of students who were aware of uveitis, likely due to recent ophthalmology training in their third year of medical school. When questioned about joint examination, they remembered being taught knee joint examination well, but rheumatologically important joints, such as the small joints of the hand, received minimal attention, and their examination was not adequately taught to the students (Table 2).

The knowledge of students in Rheumatological Illness was below optimal. Knowledge scores were also significantly different between the final years and interns. The mean confidence level in evaluating rheumatological conditions (Fig. 2) was also significantly different between interns and those in their final years, showing that increasing the amount of practical training during internships increased their confidence levels. This reflects improved confidence with improved training. Nevertheless, the participants' confidence levels were suboptimal, with a mean score less than five for both interns and students in their final years.

Overall, among all participants, there was a noticeable knowledge gap (Fig. 3) and a lack of confidence in evaluating rheumatological conditions compared to cardiology, neurology, or pulmonology. Despite rheumatological disorders being included in current medical training, the emphasis placed on them is far from optimal.

Our study also highlights the difficulties faced by students in the field of rheumatology. Most students



Fig. 2 Comparison between undergraduates and Interns for Knowledge score, confidence level in Rheumatological conditions (RH) and other conditions (OTH)

Table 3	Mean Knowledge score, confidence level for	
Rheumat	ology (RH) and others (OTH)	

Final Year (Mean±SD)	Intern (Mean±SD)
5.43±2.037	5.92 ± 2.144
3.38 ± 1.90	4.11±2.21
4.61±2.06	4.82 ± 2.44
	Final Year (Mean±SD) 5.43±2.037 3.38±1.90 4.61±2.06

(54.48%) opined that inadequate training in musculoskeletal examination was the primary reason for their struggles. Additionally, around one-third of the students identified less exposure to cases, the complex nature of immunology, and the lack of emphasis on rheumatology in their exam-oriented preparation as significant challenges. These data will help us take remedial measures to address these issues.

Our results are consistent with a similar study conducted in South India by Thomas et al., who concluded that medical students are inadequately exposed to rheumatological illnesses [7]. A similar study conducted in a Nigerian medical school also concluded that training in rheumatology was largely inadequate [8]. In another study performed among internal medicine residents, the participants felt that there was a need to strengthen their rheumatology skills [9, 10].

Postdoctoral specialty training in rheumatology has advanced significantly in recent years, with an increase in fellowships and super-specialty (DM) seats [11, 12]. However, this progress has not resulted in a greater translation of knowledge to undergraduate medical students.

To increase awareness of rheumatology, measures such as including musculoskeletal examination as part of routine medicine clinics and involving medical and orthopedic postgraduate students in teaching undergraduates can be implemented. Immunology topics can be taught via interactive videos and animated lectures using clear illustrations. To increase exposure to cases, students can be electively posted in rheumatology superspecialty clinics during their medicine or orthopedic rotations, allowing them to gain a comprehensive understanding of the subject. Additionally, giving rheumatology patients more importance during practical internal medicine exams and including rheumatological procedures, such as synovial fluid aspiration and intra-articular steroid injections, as part of the "must know" competencies can be beneficial.

In this study, multiple centers across the country were recruited, which contributed to a larger and more diverse sample size. This greater sample size enhances the generalizability and reliability of the findings, allowing for a more comprehensive understanding of the current state of rheumatology education in UG curriculum. Additionally, the study assesses existing deficiencies in knowledge to enhance future teaching guidelines. The observed difference in confidence between rheumatological and non rheumatological illnesses underscores the fact that rheumatology receives less emphasis than other subspecialties during undergraduate training, highlighting the need for modifications in our curriculum.

There are some limitations in our study. It did not include questions specifically designed to identify the desired corrective measures from the students' perspectives. Additionally, the study relied on a participantadministered questionnaire, which can lead to potential biases such as self-reporting errors and missing data. Some participants may have misunderstood questions or skipped items, which can affect the accuracy and completeness of the collected data. Furthermore, the variability in students' knowledge may be attributed to differences in the duration of their postings across specialties.



Fig. 3 Confidence levels for examination of rheumatological (RH) and other (OTH) conditions among all participants

Further studies can focus on recruiting students from across the globe to assess the level of exposure to rheumatological illnesses. Additionally, prospective studies can be conducted after implementing reformative changes to evaluate their effects. These efforts can help identify gaps and develop targeted interventions to improve education and awareness worldwide. Curriculum reforms in Rheumatology could include integrating a more comprehensive and practical approach to teaching rheumatological disorders, incorporating hands-on experiences and case-based learning. By updating the curriculum we can ensure that students are better equipped with the knowledge and skills necessary to manage these conditions effectively in their future practice.

Conclusion

This study highlights a concerning knowledge gap among students in the basic understanding and examination of musculoskeletal conditions. There is a considerable difference in knowledge and confidence levels between final-year students and interns, with interns showing greater confidence. However, confidence in examining rheumatological conditions remains lower as compared to others, underscoring inadequate training in this area. The findings suggest the need for revising medical curricula to include more comprehensive rheumatology training, greater exposure to a wider range of rheumatic diseases, and enhanced practical training in joint examinations. Addressing these gaps is essential for the early recognition and timely treatment of these increasingly prevalent diseases. Collaborations between medical schools and rheumatology societies could facilitate the development of standardized training programs.

Rheumatology Training and Awareness among undergraduates in Indian Medical Schools: A Multicenter observational study



Summary : There is a knowledge gap in musculoskeletal conditions among students Confidence in examining rheumatological conditions is lower than non-rheumatological ones, indicating inadequate training

Fig. 4 Graphical Abstract (created using Biorender.com)

Supplementary Information

The online version contains supplementary material available at https://doi.or g/10.1186/s12909-025-06843-2.

Supplementary Material 1

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Author contributions

D.A., S.S and S.K collected the data and did the primary analysis. D.A, S.K and K.K wrote the main manuscript. D.A prepared the manuscript Figs. 1, 2, 3 and 4; Tables 1, 2 and 3All authors reviewed the manuscript.

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Data availability

The dataset has been uploaded in a public data repository (Figshare) and the link to access is https://figshare.com/s/87ed01f9b04ee2d30ea4.

Declarations

Ethics approval and consent to participate

Prior to commencement of the study Institutional ethics clearance was obtained from Bharati Vidyapeeth Medical college and Hospital Institutional ethics committee (DHR Reg No: EC/NEW/INST/2020/656) on 12th August 2022. Informed consent was obtained from each participant before the survey.

Consent for publication

Not applicable.

Competing interests The authors declare no competing interests.

Author details

¹Department of Clinical Immunology and Rheumatology, Bharati Vidyapeeth Medical College and Hospital, Pune, India

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