Rheumatology Training for Undergraduate Medical Students in Uganda: A Need Assessment Survey

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ABSTRACT

OBJECTIVES: Despite the rise in the common rheumatological and musculoskeletal disorders (RMDs) in Africa, rheumatology remains an under recognized field with limited training and exposure of medical students. We assessed the knowledge of undergraduate medical students in Uganda on RMDs occurring in our settings.

METHODS: A descriptive cross-sectional study was conducted among clinical year medical students at 9 universities in Uganda offering undergraduate medical degrees in March and April 2022. A self-administered, semistructured questionnaire was used to collect data on sociodemographic characteristics and basic knowledge on RMDs online using KoboToolbox. Sufficient knowledge was defined as a score of ≥50% (pass mark for undergraduate students in Uganda). Multivariable logistic regression was performed using STATA 16 to determine factors associated with knowledge acquisition on RMDs.

RESULTS: We enrolled 359 medical students from 9 medical training institutes across Uganda. Overall, 126 (35.1%) participants had sufficient knowledge and the overall mean score for all participants was 41.2%. Factors independently associated with sufficient knowledge were: being in fourth (adjusted odds ratio [aOR]: 2.6, 95% confidence interval [CI]: 1.49-4.64, $P < .001$) and fifth year (aOR: 2.2, 95% CI: 1.18-4.18, $P = .013$) compared to third year of study, awareness of the speciality of rheumatology (aOR: 4.0, 95% CI: 1.96-8.06, $P < .001$), formal classes on rheumatology (aOR: 2.0, 95% CI: 1.15-3.35, $P = .012$), prior bedside teaching on RMDs (aOR: 2.3, 95% CI: 1.49-3.69, $P < .001$), awareness of common RMDs (aOR: 3.2, 95% CI: 1.67-6.04, $P < .001$), and having seen a patient with an RMD (aOR: 1.8, 95% CI: 1.14-2.77, $P < .01$).

CONCLUSION: There was a significant knowledge gap among undergraduate medical students nationwide on rheumatology. There is an urgent need to increase exposure to RMDs for undergraduate medical students to address the rising burden of RMDs in Uganda.

KEYWORDS: rheumatology, rheumatic diseases, DMARDs, medical education, Uganda

Introduction

Rheumatological and musculoskeletal disorders (RMDs) are the second leading cause of disability in the world with the fourth highest impact on disability-adjusted life years.[1] RMDs pose a significant limitation of participation in several activities by the patients that is further coupled with reduced quality of life of the affected individuals.[2,3] RMDs such as rheumatoid arthritis, systemic lupus erythematosus (SLE), Sjogren's syndrome, etc are chronic, autoimmune, and inflammatory disorders that affects multiple organ systems, particularly joints, skin, and muscles.[4,5]

RMDs are one of the most common causes of morbidity and yet rheumatology—the study of RMDs, is still not given the appropriate attention in the undergraduate curriculum.[6] Having realized that undergraduate medical education in rheumatology was inadequate early in the 21st century, robust efforts have since been employed to improve education to this effect. Early exposure of medical students to rheumatology not only increases their awareness of the RMDs but also raises the chances of the students choosing this field of study.[7,8] However, whereas the specialty of rheumatology in Africa is still growing, it is worth noting that it has made more progress.[4] RMDs such as SLE and rheumatoid arthritis are increasingly recognized in African countries, including in Uganda.[4]

Rheumatology is under-recognized in the undergraduate curricula of many medical schools. In medical schools in Uganda, the topics on RMDs are taught in a single 2 to 3h lecture or tutorial in fifth year of undergraduate medical training under internal medicine under the guidance of a rheumatologist. Thereafter, the students are expected to attain additional knowledge on RMDs from bedside teachings upon encountering a patient with one of the RMDs. However, patients with RMDs are often admitted due to opportunistic infections, which make the points of discussion, rather than the RMDs. In addition, there are fewer chances of topics on RMDs appearing in the final internal medicine exams for undergraduate medical students than the other topics such as infectious diseases.

This has led to insufficient awareness and exposure of medical students on RMDs. This has been attributed to the limited number of rheumatologists and other health professionals trained as educators to contribute to the students' expertise in rheumatology.[8] Recent publication from India showed that only 11% of medical students scored more than 50% in all domains of rheumatology.[9] Therefore, there is an existing gap in knowledge on rheumatology among undergraduate students which has continuously affected primary care of patients with RMDs.

Medical students eventually become the primary care providers who ought to have basic knowledge on RMDs. Knowledge on RMDs among medical students in Africa has not been widely reported, with only a few studies conducted highlighting the inadequate knowledge among medical students in Africa.[10,11] We sought to assess the awareness of rheumatology and knowledge on common RMDs and their treatment among undergraduate clinical year medical students in Uganda.

Methods

Study design

A descriptive analytic cross-sectional study was conducted, and data collected quantitatively between March 19 and April 23, 2022.

Study setting

The study was conducted in 9 universities in Uganda offering undergraduate medical degrees, that is, Makerere University Kampala (Mak), Mbarara University of Science and Technology (MUST), Gulu University (GU), Kampala International University (KIU), Kabale University (KU), Busitema University (BU), Islamic University in Uganda (IUIU), King Caesar International University (KCU), and Uganda Christian University (UCU). Mak, GU, MUST, BU, and KU are public universities, and the remaining universities are private. The combined population size of all these medical schools is about 6000 to 7000 students. The undergraduate medical curriculum in Uganda involves undertaking biomedical sciences in the first 2 years and clinical work in the last 3 years of medical school, where learning is facilitated through lectures, tutorials, clinical rotations on wards and in clinics and community placements.

Study population

The study involved undergraduate clinical year medical students-years 3, 4, and 5, pursuing Bachelor of Medicine and Bachelor of Surgery (MBChB); an undergraduate degree program in the abovementioned universities.

Selection criteria

Undergraduate medical students pursuing MBChB at the abovementioned universities; aged 18 years and above were enrolled and participated in the study. A random sampling technique was used. Only those who consented to participate were included. Those without access to internet were excluded.

Sample size

The sample size was calculated using the modified Kish and Leslie formula, with an estimated knowledge of 50% and a population size of 540, and type 1 error of 5%

$$N = \frac{Z^2 PQ}{d^2}$$

where Z is the standard deviation at 95% CI (1.960), d the precision of the estimate (5%) (95% CI), P the average knowledge on RMDs (50%), N the sample size. Q is $1-P$, $Q = 1-0.5$; that is, $Q = 0.5$

$$N = \frac{1.960^2 \times 0.5 \times 0.5}{0.05^2}$$

$$N = 384 \text{ respondents}$$

Data collection

Quantitative data was collected using a self-administered, semi-structured questionnaire that had both open and closed ended questions, and a consent form appended to it for the participants to provide informed consent. Questionnaires were used to collect the data; with the KoboToolbox link circulated using students' WhatsApp platforms by their respective class leaders. The questions were developed based on rheumatology textbooks, pre-existing publications and expertise of physicians experienced in the management of RMDs.[6,9,11–13] The questionnaire consisted of 2 parts: sociodemographic characteristics, knowledge on common RMDs, clinical features, and their management. The questions covered the common rheumatological diseases which were considered as part of the basic awareness in the field of rheumatology.

Study variables

We assessed knowledge on common RMDs. Additional data collected included, social demographics; age, university, year of study, prior training, rheumatology clinical exposures, and formal classes/bedside teaching on RMDs.

Operational definition

Sufficient knowledge was defined as a score of ≥50% on a set of 41 questions which were carefully evaluated by 2 physicians with experience in rheumatology (MK and FB). A score of 50% is the standard pass mark for all subjects taught as undergraduates in Uganda.

Statistical analysis

The data was analyzed using Microsoft Excel 2016 and the STATA version 16.0 software. Numerical data was

summarized as mean and standard deviation for normally distributed or median and interquartile range for non-normally distributed data. Categorical data was presented as proportions and frequencies. Chi-square and Fischer's exact tests were used to compare categorical variables and t-tests or Mann-Whitney U for numerical data. Multivariable logistic regression analysis was used to determine predictors of knowledge on common rheumatological diseases. Statistical significance was set a $P < .05$.

Ethics approval

Ethical approval was sought from Mulago Hospital Research and Ethics Committee (approval number: MHREC 2162). All participants provided informed consent by signing a consent form appended to the questionnaire. The study was conducted in observance of the *Declaration of Helsinki*.

Public and patient involvement

There was no public or patient involvement in the design, conducting, reporting, or dissemination plans of our research.

Table 1. Demographic characteristics.

Variable	Frequency	Percent
Age, mean (standard deviation), years	24.6	3.1
<25	244	68
≥25	115	32
University of study		
Gulu	51	14.2
Busitema	23	6.4
Islamic University in Uganda	24	6.7
Kabale	30	8.4
Kampala International	74	20.6
King Caesor	29	8.1
Makerere	63	17.6
Mbarara	20	5.6
Uganda Christian	45	12.5
Year of study		
3	103	28.7
4	163	45.4
5	93	25.9
Prior diploma training		
No	312	86.9
Yes	47	13.1
Diploma (n = 47)		
Nursing	4	8.5
Clinical medicine	36	76.6
Physiotherapy	4	8.5
Laboratory technology	3	6.4

Table 2. Rheumatology teaching and clinical exposure.

Variable	Frequency	Percent
Have you heard about rheumatology		
No	58	16.2
Yes	301	83.8
Have you had any formal classes on rheumatic diseases?		
No	95	26.5
Yes	264	73.5
Have you ever had a bedside teaching on any rheumatic disorder?		
No	233	64.9
Yes	126	35.1
If yes, which condition(n = 126)		
Gout	6	2.4
Osteoarthritis	11	8.7
Rheumatoid arthritis	90	63.5
Systemic lupus erythematosus	19	15.1
Does your teaching hospital have a dedicated rheumatology clinic?		
No	298	83
Yes	61	17
If yes, have you attended the clinic (n = 61)		
No	44	72.1
Yes	17	27.9
Have you heard of any common rheumatic diseases?		
No	50	13.9
Yes	309	86.1
Have you ever seen a patient with a rheumatic disease?		
No	112	31.2
Yes	247	68.8
Have you heard of disease modifying antirheumatic drugs?		
No	209	58.2
Yes	150	41.8

Table 3. Knowledge on diagnosis and management of common rheumatic diseases.

Number	Variable	Frequency (correct responses)	Percent (correct responses)
1	Rheumatology is a branch of medicine involving diagnosis and treatment of rheumatic diseases (chronic autoimmune inflammatory disorders) such as rheumatoid arthritis	304	85.00
2	Autoimmune rheumatic diseases are much more common in men than in woman	114	31.75
3	Autoimmune rheumatic diseases do not affect children	276	76.90
4	Osteoarthritis is an autoimmune rheumatic disease	132	36.80
5	Patients with osteoarthritis require long-term corticosteroid use	66	18.40
6	Rheumatoid arthritis is the most common autoimmune rheumatic disease in Uganda	217	60.40
7	Confirmatory test for rheumatoid arthritis	91	25.40
8	Rheumatoid arthritis is incurable	168	46.80
9	Aware of extra articular complications of rheumatoid arthritis	146	40.70
10	Gout is an autoimmune rheumatic disease	195	54.30
11	Confirmatory test for gout	317	88.30
12	Gout is curable	96	26.70
13	Affect men more than women	87	24.20
14	Complication of systemic lupus erythematosus	200	55.70
15	Systemic lupus erythematosus can mimic tuberculosis	211	58.80
16	Exposure to sunshine make systemic lupus erythematosus worse	209	58.20
17	Systemic lupus erythematosus can co-exist with rheumatoid arthritis	275	76.60

Table 3. Continued.

Number	Variable	Frequency (correct responses)	Percent (correct responses)
18	Systemic lupus erythematosus is confirmed by	67	18.70
19	Antinuclear antibody can be positive in normal population	146	40.70
20	Systemic lupus erythematosus affects more women than men	130	36.20
21	Common complications in scleroderma	203	56.60
22	Scleroderma can be systemic or localized	190	52.90
23	Scleroderma affects more women than men	13	36.20
24	Drug of choice for systemic lupus erythematosus	38	10.60
25	Drug of choice for gouty arthritis	38	10.60
26	Drug of choice for gout	128	35.70
27	Drug of choice for osteoarthritis	77	21.50
28	Drug of choice for scleroderma	39	10.90
29	Aware of disease modifying antirheumatic drugs	125	34.80

Results

Baseline characteristics

Overall, 700 clinical year medical students (an average of 78 students per medical school) were asked to participate in the study and had the questionnaire sent to them. Of the anticipated 384 responses, 359 (response rate 359 of 700) were returned. Most participants were from KIU (n = 74, 20.6%) and MUK (n = 63, 17.6%). The mean age of all participants was 24.6 (SD: 3.1) years. Most (45.4%, n = 163) participants were in their fourth year of study. Forty-seven (13.1%) participants had a prior diploma training, mostly (76.6%, n = 36) in clinical medicine, Table 1.

Rheumatology teaching and clinical exposure

Majority of the student had ever heard about (83.8%, n = 301), and had formal classes (73.5%, n = 264) on RMDs/rheumatology. However, only 126 (35.1%) participants had ever had a bedside teaching on RMDs and majority of these were on

rheumatoid arthritis (63.5%, n = 90). A total of 247 (68.8%) participants reported seeing patients with RMDs during their clinical rotations and only 150 (41.8%) had heard about disease modifying antirheumatic drugs, Table 2.

Interestingly, 54 (15.0%) participants thought rheumatology was the study of rheumatic fever and/or rheumatic heart disease, Table 3.

Knowledge on rheumatology

Overall, 126 (35.1%) participants had sufficient knowledge on rheumatology. The overall mean score was 41.2 (SD: 17.8) %. Only 4 (1.1%) scored above 80%. The mean score

Figure 1. Mean knowledge score of participants stratified by year of study. There was a statistically significant trend toward better knowledge with higher level of education.

significantly increased from third through fifth year of study ($P < .001$), Figure 1. There was a statistically significant variation in marks scored across the various medical schools with participants from BU (49.2%), MUST (47.7%), and KIU (47%) scoring the highest marks and GU (31.9%), IUIU (39.9%), and MUK (37.4%) scoring lower marks ($P < .001$), Figure 2.

Factors associated with sufficient knowledge on rheumatology

At bivariate analysis, factors significantly associated with sufficient knowledge on rheumatic diseases were year of study ($P = .003$), awareness about rheumatology ($P < .001$), having had formal classes on rheumatology ($P = .012$), prior bedside teaching on RMDs ($P < .001$), awareness of common rheumatic diseases ($P < .001$) and having seen a patient with a rheumatic disease ($P = .011$), Table 4.

At multivariable logistic regression see Table 5. Factors independently associated with sufficient knowledge on rheumatology were: being in fourth (adjusted odds ratio [aOR]: 2.6, 95% CI: 1.49-4.64, $P < .001$) and fifth year (aOR: 2.2, 95% CI: 1.18-4.18, $P = .013$) compared to third year of study, awareness of the speciality of rheumatology (aOR: 4.0, 95% CI: 1.96-8.06, $P < .001$), formal classes on rheumatology (aOR: 2.0, 95% CI: 1.15-3.35, $P = .012$), prior bedside teaching on RMDs (aOR: 2.3, 95% CI: 1.49-3.69, $P < .001$), awareness of common RMDs (aOR: 3.2, 95% CI: 1.67-6.04, $P < .001$) and having seen a patient with an RMD (aOR: 1.8, 95% CI: 1.14-2.77, $P < .01$).
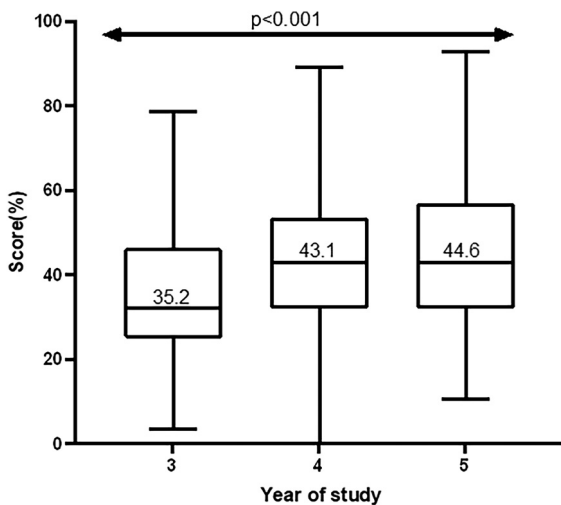
Discussion

In this study, we assessed the knowledge of undergraduate medical students in Uganda about rheumatology and RMDs,
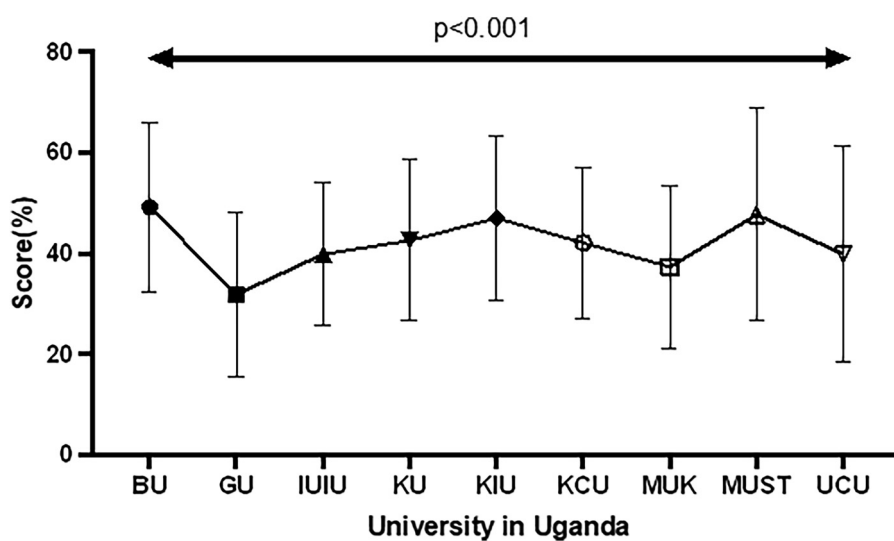

Figure 2. Mean knowledge score of participants stratified by university of study. Abbreviations: BU, Busitema University; GU, Gulu University; IUIU, Islamic University in Uganda; KCU, King Ceasor University; KIU, Kampala International University; KU, Kabale University; Mak, Makerere University, Kampala; MUST, Mbarara University of Science and Technology; UCU, Uganda Christian University.

Table 4. Bivariate analysis of factors associated with knowledge on rheumatic diseases.

Variable	All (n=) Frequency (%)	Knowledge on rheumatic diseases		P value
		Poor (n = 233) Freq (%)	Sufficient (n = **126**) **Frequency (%)**	
Age, median (interquartile range), years	24.6 (3.1)	24.4 (2.9)	24.9 (3.2)	.082
<25	244 (68)	164 (70.1)	80 (64)	.285
≥25	115 (32)	70 (29.9)	45 (36)	
Year of study				
3	103 (28.7)	81 (34.6)	22 (17.6)	**.003**
4	163 (45.4)	95 (40.6)	68 (54.4)	
5	93 (25.9)	58 (24.8)	35 (28.0)	
Prior diploma training				
No	312 (86.9)	205 (87.6)	107 (85.6)	.624
Yes	47 (13.1)	29 (12.4)	18 (14.4)	
Diploma (n = 47)				
Nursing	4 (8.5)	2 (6.9)	2 (11.1)	.463
Clinical medicine	36 (76.6)	21 (72.5)	15 (83.3)	
Physiotherapy	4 (8.5)	3 (10.3)	1 (5.6)	
Laboratory technology	3 (6.4)	3 (10.3)	0 (0)	
Have you heard about rheumatology				
No	58 (16.2)	60 (25.6)	10 (8)	**<.001**
Yes	301 (83.8)	174 (74.4)	115 (92)	
Have you had any formal classes on rheumatic diseases?				
No	95 (26.5)	72 (30.7)	23 (18.4)	**.012**
Yes	264 (73.5)	162 (69.2)	102 (81.6)	
Have you ever had a bedside teaching on any rheumatic disease condition?				
No	233 (64.9))	168 (71.8)	65 (52)	**<.001**
Yes	126 (35.1)	66 (28.2)	60 (48)	

(continued)

Table 4. Continued.

Variable	All (n=) Frequency (%)	Knowledge on rheumatic diseases		P value
		Poor (n = 233) Freq (%)	Sufficient (n = **126**) **Frequency (%)**	
Does your teaching hospital have a dedicated rheumatology clinic?				
No	298 (83)	198 (84.6)	100 (80)	.302
Yes	61 (17)	36 (15.4)	25 (20)	
If yes, have you attended the clinic (n = 61)				
No	44 (72.1)	28 (77.8)	16 (64)	.261
Yes	17 (27.9)	8 (22.2)	9 (36)	
Have you heard of any common rheumatic diseases?				
No	50 (13.9)	63 (26.9)	13 (10.4)	**<.001**
Yes	309 (86.1)	171 (73.1)	112 (89.6)	
Have you ever seen a patient with a rheumatic disease?				
No	112 (31.2)	129 (55.1)	51 (40.8)	**.011**
Yes	247 (68.8)	105 (44.9)	74 (59.2)	

we found that about 84% of clinical year medical students had ever heard about rheumatology as a specialty. However, only about one-third of medical students had sufficient knowledge on the common RMDs. Moreover, the overall mean score was below average (41.2%) even though majority of the medical students had formal classes on rheumatology. Some of the factors that were positively associated with knowledge on rheumatology include being in fourth or fifth year, having had formal classes, bedside teachings as well as having seen a patient with a rheumatological condition. Rheumatology needs to be integrated into undergraduate curriculum to enhance awareness on the epidemiology, diagnosis, and treatment of the common RMDs in Uganda and similar settings across Africa where rheumatology practices are poorly established.

The mean score across all the medical schools in Uganda was below 50%. This indicates a significant knowledge gap regarding the speciality of rheumatology and RMDs among medical

Table 5. A multivariable logistic regression analysis of factors associated with knowledge on rheumatic diseases.

Variable	Adjusted Odds Ratio	95% Confidence interval	P value
Year of study			
3	1.0	—	**.001**
4	2.6	1.49-4.64	
5	2.2	1.18-4.18	**.013**
Have you heard about rheumatology			
No	1.0	—	**<.001**
Yes	4.0	1.96-8.06	
Have you had any formal classes on rheumatic diseases?			
No	1.0	—	**.012**
Yes	2.0	1.15-3.35	
Have you ever had a bedside teaching on any rheumatic disease condition?			
No	1.0	—	**<.001**
Yes	2.3	1.49-3.69	
Have you have heard of any common rheumatic diseases?			
No	1.0	—	**<.001**
Yes	3.2	1.67-6.04	
Have you ever seen a patient with a rheumatic disease?			
No	1.0	—	**.010**
Yes	1.8	1.14-2.77	

students in their clinical years in Uganda. Our finding is consistent with a study conducted in India by Thomas and colleagues, which showed that about 4 in 5 of medical students had insufficient knowledge on rheumatology and RMDs.[9] In the same study, rheumatoid arthritis was the most known RMD to medical students. This finding is similar to that in our study where majority (about 63.5%) had a formal teaching about rheumatoid arthritis. Rheumatoid arthritis is the most common autoimmune RMD in Uganda and, patients have higher chances of being admitted during the flares.[3,14] This therefore offers an opportunity for the students to interface with patients with rheumatoid arthritis, however, this may not be the case for other rheumatological disease conditions. There are limited studies across Africa and the world at large

on rheumatology which is an area for future studies to guide training of primary care physicians given the increasing burden of RMDs globally.

Rheumatology is an emerging speciality in many countries. There are few rheumatologists and rheumatology clinics across Uganda. In fact, there are <5 physicians specialized in care of patients with RMDs. Therefore, clinical exposure and bedside teaching for students is much more limited compared to other disease conditions such as infectious diseases which are highly endemic in Uganda.[15] This could explain why about one-quarter of the participants attributed rheumatology as a study of rheumatic heart disease/fever. Rheumatic heart disease is the most commonly acquired heart disease in Uganda due to postinfectious sequel of *Streptococcus pyogenes* pharyngitis or skin disease.[16,17] Our findings suggest that RMDs are still under-recognised in the undergraduate curricula of medical schools and has resulted into a significant knowledge gap among medical students necessitating significant intervention to improve healthcare provided to patients with RMDs.

Only 1 university, Mak, has a dedicated rheumatology clinic in its teaching hospital (Mulago National Specialised Referral and Teaching Hospital). Consequently, our findings show that over 80% of the participants did not have access to a dedicated rheumatology clinic in their teaching hospital of which, only a few (27.9%) of those had ever attended the clinic. This significantly contributes to the existing knowledge gap. Having formal classes or bedside teachings has been shown to provide basic knowledge to medical students on the topic in question. Therefore, having more formal classes, tutorials, and bedside teachings on rheumatology as part of the core undergraduate curriculum in addition to a dedicated rheumatology clinic accessible to each medical school will significantly improve overall knowledge on RMDs and essentially, patient care.[9]

Our study has some limitations. The questionnaire we used was not standardized, however, it was based on rheumatology textbooks, pre-existing publications, and expertise of physicians experienced in the management of RMDs in Uganda. Future standardization of the questionnaire is recommended to advance development of locally appropriate rheumatology course contents for undergraduate medical students. Secondly, much as our sample size was powered to answer the prespecified research objectives, it was small to adequately reflect the awareness and knowledge of the entire body of medical students in Uganda. However, this is the first study to report on knowledge on RMDs among undergraduate students in Uganda. The self-administered nature of the questionnaire could have enabled participants to lookup answers to the questions. This study's strengths included the multicentre nature of the study that included several medical schools in Uganda as well as including medical students from more than just one clinical year.

Conclusions

In summary, we found a significant gap in knowledge on rheumatology and RMDs among medical students in Uganda. Our findings highlight the need for interventions to increase contact time between students and rheumatologists as well as patients living with RMDs to improve their knowledge in that regard.

Contributorship statement

All authors contributed significantly to the conceptualization, data collection, analysis, interpretation, and manuscript writing. All authors read and approved the final manuscript.

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