

Physician practices in referring rheumatoid hand and thumb carpometacarpal arthritis cases to hand surgeons

Zahir T. Fadel, MD, MSc, Zainalabden E. Jefri, Medical Student, Hussain A. Alkhalifah, Medical Student, Hanin M. Y. Ahmad, Medical Student, Raghad A. Alzahrani, Medical Student, Mohammed B. Ashi, MBBS, Osama A. Samargandi, MD, MSc.

ABSTRACT

الأهداف: دراسة ممارسات تحويل حالات تشوهات اليد الروماتويدية والتهاب مفصل قاعدة الإبهام لدى الأطباء من تخصصات مختلفة وتحديد العوائق المحتملة لتحويل هذه الحالات لجراحة اليد. قد تتطلب تشوهات اليد الروماتويدية و التهاب مفصل قاعدة الإبهام الجراحة في حال حدوث التشوهات. على الرغم من ذلك، فلا يزال معدل الإحالات إلى جراحي اليد منخفضاً في المملكة العربية السعودية.

المنهجية: أجريت دراسة مقطعية شملت 102 من استشاريي طب الأسرة، الروماتيزم، وجراحة العظام في مختلف مناطق المملكة العربية السعودية. تم التواصل مع 30 منشأة بغرض توزيع الاستبانة على أطبائهم؛ شملت تلك المؤسسات ثمان مستشفيات خاصة، 16 مستشفى حكومياً وستة مراكز رعاية صحية أولية. شملت الاستبانة أسئلة حول مدى تفشي المرض، معدل الإصابة به، التدابير العلاجية، مدى المعرفة والإحالة للمرضى الذين يعانون من تشوهات اليد الروماتويدية والتهاب مفصل قاعدة الإبهام باستخدام مقياس (Likert) من 5 نقاط. تم استخدام اختبار (Kruskal-Wallis H) في تحليلنا لتقييم الفروقات بين أطباء التخصصات الثلاث.

النتائج: بالنسبة لتشوهات اليد الروماتويدية والتهاب مفصل قاعدة الإبهام كان معدل الإحالة أعلى بين جراحي العظام مقارنة بأطباء الروماتيزم وأطباء الأسرة. كما كانت الحواجز الرئيسية للإحالة هي رفض المريض، اعتبار العلاج الدوائي وحده كافياً، ونقص الوعي لدى الأطباء بالخيارات الجراحية.

الخلاصة: تسلط نتائجنا الضوء على التباين في أنماط تحويل الأطباء لحالات تشوهات اليد الروماتويدية والتهاب مفصل قاعدة الإبهام إلى جراحي اليد، مما يشير إلى الحاجة لتدخلات تهدف لتحسين معدلات الإحالة وتعزيز المخرجات العلاجية للمرضى.

Objectives: To investigate the referral practices across different medical specialties and identify possible barriers to hand surgery referral. Rheumatoid hand deformities (RHDs) and thumb carpometacarpal (CMC) arthritis may require surgery once deformities occur. However, in Saudi Arabia, the rate of referrals to hand surgeons remains low.

Methods: This was a cross-sectional study that included 102 consultants of family medicine, rheumatology, and orthopedics across various regions of Saudi Arabia. A total of 30 institutions were contacted and requested to distribute a survey questionnaire to their physicians;

these institutions included 8 private hospitals, 16 government hospitals, and 6 primary healthcare centers. The survey included questions on the incidence, rate, management, knowledge, and referral of patients with RHD and CMC arthritis using a 5-point Likert scale. The Kruskal-Wallis H test was utilized in our analysis to evaluate the differences in responses among the 3 specialties.

Results: For RHD and thumb CMC arthritis, the referral rate was higher among orthopedic surgeons compared to rheumatologists and family medicine physicians. The main barriers to referral were patient refusal, medical treatment alone being deemed adequate, and a lack of awareness of surgical options for management.

Conclusion: Our findings highlight discrepancies in patterns of physician referral of RHD and thumb CMC arthritis cases to hand surgeons, indicating the need for targeted interventions to improve referral rates and enhance patient outcomes.

Keywords: rheumatoid arthritis, hand deformities, carpometacarpal joint, thumb; arthritis, Saudi Arabia, referral and consultation, physician practice patterns

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From the Division of Plastic Surgery, Department of Surgery (Fadel, Samargandi), Faculty of Medicine King Abdulaziz University, and from the Faculty of Medicine (Jefri, Alkhalifah, Ahmad, Alzahrani), King Abdulaziz University; and from the Department of Plastic and Reconstructive Surgery (Ashi), National Guard Hospital, Jeddah, Kingdom of Saudi Arabia.

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*Address correspondence and reprint request to: Dr. Zainalabden E. Jefri, Faculty of Medicine, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia. E-mail: Zainessamaljefri@gmail.com.
ORCID ID: <https://orcid.org/0009-0003-4871-0044>*

Rheumatoid arthritis (RA) is an autoimmune inflammatory disease that affects synovial tissues. Although this disease primarily affects the joints, it also has multiple extraskeletal manifestations. It targets the hand, wrist, and knees, leading to synovial expansion and joint degradation.¹ Approximately 0.1-2% of the world population is affected by RA.² Osteoarthritis (OA) is a chronic degenerative disease that causes cartilage loss and joint destruction. Approximately 528 million people worldwide have OA; this disease only affects the joints.³⁻⁵ Rheumatoid arthritis and OA affect women more than men, and patients with OA tend to be older than those with RA.³⁻⁶

Both RA and OA can cause pain and deformities in the hand due to attritional changes in the surrounding joint structures.⁷⁻⁹ Rheumatoid arthritis commonly affects the hand in many patients.⁸ It affects small joints symmetrically and involves the proximal interphalangeal and metacarpophalangeal joints of the hand; this leads to reduced grasping ability and grip strength, which markedly affects hand function, impairing the ability to carry out daily activities.^{10,11} In contrast, OA affects the proximal and distal interphalangeal joints of the hand and does not necessarily present a symmetric distribution.¹² Osteoarthritis leads to progressive dislocation, dysfunction, and joint deformities. Osteoarthritis can develop due to aging, athletic injuries, or cumulative joint stress caused by strenuous activities.¹³ A commonly affected joint is the thumb carpometacarpal (CMC) joint, known as thumb basal joint arthritis. The reported prevalence of thumb CMC arthritis is approximately 20%.¹⁴ It causes a substantial decrease in pinch strength, reduces the ability to hold large objects, and induces sharp pain when performing activities involving tight gripping or twisting.¹⁵ Osteoarthritis and RA can be managed conservatively or surgically. Surgical management aims to reduce pain and deformity while striving to restore function. Rheumatoid hand deformities (RHDs) with persistent pain and synovitis that do not respond to treatment for 3-4 months are indications for surgery.^{16,17} When non-surgical interventions prove ineffective in halting the progression of thumb CMC arthritis, surgical intervention becomes a viable option. The approach to their management is contingent upon clinical observations and radiological assessments.¹⁰

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In Saudi Arabia, the rate of referrals to hand surgeons remains low despite the availability of various surgical options for treating these conditions. No previous studies have assessed referral practices. A 2005 study by Kotsis et al¹⁷ investigated differences in surgical practices for RHD in various regions worldwide. They found that economic and cultural factors guided interventions in such cases. Additionally, a notable diversity in the approaches of rheumatologists and hand surgeons has been observed. While, in certain areas, both specialties collaborate within a shared clinic, in other regions, these experts maintain distinct practices, exhibiting differing viewpoints on the optimal timing for surgical intervention.¹⁷ A study conducted in China showed that most hand surgeons felt that they encountered relatively few patients with RHD owing to fewer referrals.¹⁸

A study by Seyferth et al¹⁹ conducted in the United States showed that among 581,770 patients with RA, only 3% were referred to a hand surgeon. In Saudi Arabia, no previous studies have assessed referral practices in this context, making this investigation particularly important. The healthcare system in Saudi Arabia presents unique challenges, including geographic disparities, varying levels of healthcare facility accessibility, and cultural factors that may influence patient and physician decision-making. Additionally, the Saudi healthcare system comprises a mix of public and private providers, with the majority of citizens receiving care through a publicly funded system that ensures free or subsidized healthcare.²⁰ This setup can sometimes lead to bureaucratic delays and a lack of coordination between primary care providers and specialists, which might result in lower referral rates.

Considering these factors, our primary aim was to investigate and compare the referral practices of different medical specialties (family medicine physicians, rheumatologists, and orthopedic surgeons) in Saudi Arabia. Our secondary aim was to obtain physicians' opinions on possible barriers to hand surgery referrals in Saudi Arabia.

Methods. This multi-center, observational, cross-sectional study was conducted at King Abdulaziz University Hospital, Jeddah, Saudi Arabia between January 2023 and July 2023. We enrolled consultant physicians practicing in governmental hospitals, private clinics, and academic universities in various cities from different provinces in Saudi Arabia. Participants were required to fulfill the following qualifications: board certification in family medicine, general orthopedic surgery, or completion of a rheumatology fellowship program. Additionally, all participants had to hold a

consultant rank classification accredited by the Saudi Commission for Health Specialties. This study was approved by the Unit of Biomedical Ethics of the Faculty of Medicine at King Abdulaziz University, Saudi Arabia. It was conducted according to the tenets of the Declaration of Helsinki. A written informed consent was obtained from all physicians who agreed to participate in this study.

Multiple data collection strategies were employed, including efforts from the supervising physician, research team, and data collectors from various regions. The questionnaire was disseminated to physicians through their respective centers to obtain a diverse and representative sample across specialties and geographic locations. We contacted a total of 30 institutions, which included 8 private hospitals, 16 government hospitals, and 6 primary healthcare centers. These institutions were selected with the aim of covering various regions of Saudi Arabia, and they represented the hospitals that we were able to reach. This study was carried out in accordance with the STROBE checklist for cross-sectional studies.

The questionnaire, comprising 32 questions, was divided into 3 sections. The first section gathered demographic data (specialty, years of clinical practice, city of practice, and hospital type). The second section, answered on a 5-point Likert scale, addressed the incidence, rate, impact on function and well-being of RA and thumb CMC arthritis, physicians' opinions on their management, knowledge on surgical outcomes, and referral of patients. The third section included additional questions about the referral practices for these patients and reasons for not referring them. The questionnaire was developed in English following a thorough literature review to generate relevant and focused questions.^{18,21,22} After formulating the questionnaire, face validation was performed by 3 plastic surgery consultants with expertise in the field and in research. These consultants were selected based on their availability and our high level of trust in their professional judgment. Each consultant independently reviewed the questionnaire and provided feedback on the relevance, clarity, and comprehensibility of the questions. Based on their feedback, the questions were modified, refined, and rephrased to enhance the overall quality of the questionnaire. The internal consistency of the second part of the questionnaire, which included the 5-point Likert-type scale, was assessed using Cronbach's α test. This part of the questionnaire included 3 sections. The first section included 6 items that asked on the incidence and effects of RHD and thumb CMC arthritis, the second included ten items

that asked on the management options for RHD and thumb CMC arthritis, and the third included 8 items that asked about referrals for RHD and thumb CMC arthritis patients. Cronbach's α was calculated for each section separately and also for the overall score of all items across the 3 sections of the second part of the questionnaire combined. The overall Cronbach's α for the 24 items across the 3 sections was 0.838. Specifically, Cronbach's α was 0.829 for the first section, 0.788 for the second section, and 0.895 for the third section.

Statistical analysis. Microsoft Excel 2016 (Microsoft Corporation, Redmond, WA, USA) was used for data entry, and SPSS statistics version 21 (IBM Corp., Armonk, NY, USA) was used for coding and data analysis. Categorical data were expressed as frequencies and percentages, while medians and interquartile ranges (IQR) were used to present the Likert scale data. The internal consistency of the main scale and subscales was measured using Cronbach's alpha test. Bivariate analysis that included the 5-point Likert scale was carried out using the Mann–Whitney U test and Kruskal–Wallis test to identify associations with the survey results. Statistical significance was set at $p < 0.05$. Notably, a post-hoc power analysis was conducted using the GPower software (version 3.1.9.6; Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) to assess the statistical power of our study. Although the Kruskal–Wallis H test was used in our analysis, GPower software requires selecting the parametric alternative (analysis of variance [ANOVA]) to perform the sample size calculation. We considered an effect size (f) of 0.40, an alpha error probability (α) of 0.05, and a total sample size of 102 participants across 3 groups (family medicine physicians, rheumatologists, and orthopedic surgeons). The results revealed a noncentrality parameter (λ) of 16.32, a critical F value of 3.09, and a calculated statistical power ($1 - \beta$ error probability) of 95.47%. These findings indicated a high level of statistical power, suggesting that the sample size employed in our study was robust enough to detect the observed effect.

Results. A total of 102 consultants, 46 (45%) family medicine physicians, 28 (27.5%) orthopedic surgeons, and 28 (27.5%) rheumatologists, agreed to participate in this survey. Most (57.8%) had no sub-specialties, and more than a quarter had practiced between 2 to 5 years (27.5%). Forty-three (42.2%) physicians reported having a subspecialty, 22 of whom were orthopedic surgeons, 17 were family medicine physicians, and 4 were rheumatologists. **Table 1** presents the participants' sociodemographic characteristics. The most common city of practice was Makkah (46.8%), followed by

Riyadh (27.5%). **Appendix 1** illustrates the geographical characteristics of the study participants.

Incidence and effects of RHD and thumb CMC arthritis. Among the specialists, rheumatologists were the most likely physicians to manage RHD and thumb *p* CMC arthritis cases, with a median score on the 5-point Likert scale of 3.00 (IQR: 3.00–4.75) for RHD cases ($p<0.001$) and 3.00 (IQR: 3.00–4.00) for thumb CMC arthritis cases ($p<0.001$). All specialists agreed that RHD and thumb CMC arthritis affected the daily functions of patients. **Table 2** demonstrates the questionnaire results related to the incidence and effects

of RHD and thumb CMC arthritis among the different specialties.

Management options for RHD and thumb CMC arthritis. Compared with orthopedic surgeons and family medicine physicians, rheumatologists were more likely to manage RHD patients with only systemic medications (median: 4.00 interquartile rate [IQR]: [3.25–5.00] versus [vs.] median: 3.00 [IQR: 3.00–4.00] vs. median: 3.00 [IQR: 2.00–4.00], $p=0.010$). A similar finding was observed in patients with thumb CMC arthritis. However, the difference was insignificant (median: 4.00 [IQR: 3.00–4.00] vs. median: 3.00 [IQR: 3.00–4.00] vs. median: 3.00 [IQR: 2.00–4.00], $p=0.483$). Significantly more orthopedic physicians believed that surgery could help relieve pain in cases of thumb CMC arthritis than rheumatologists and family medicine physicians (median: 4.50 (IQR: 4.00–5.00) vs. median: 3.00 [IQR: 3.00–4.00] vs. median: 4.00 [IQR: 3.00–4.00], $p<0.001$). Similar results were observed for RHDs, with significantly more orthopedic surgeons believing that surgery could help relieve pain ($p=0.007$). Moreover, substantially more orthopedic surgeons than rheumatologists and family medicine physicians believed that surgery for thumb CMC arthritis could improve patient function (median: 4.00 [IQR: 3.25–5.00] vs. median: 4.00 [IQR: 3.00–4.00] vs. median: 4.00 [IQR: 3.00–4.00], $p=0.014$). Although a higher number of orthopedic surgeons than rheumatologists and family medicine physicians believed that surgery for RHD can improve patient function, the difference was not significant (median: 4.00 [IQR: 3.00–5.00] vs. median: 3.50 [IQR: 2.00–4.00] vs. median: 4.00 [IQR: 3.00–4.00], $p=0.086$). **Table 3** shows the physicians'

Table 1 - Sociodemographic and clinical characteristics of participating physicians.

Variables	n	%
Specialty		
Family medicine	46	45.0%
Orthopedic surgeons	28	27.5%
Rheumatology	28	27.5%
Do you have a subspecialty?		
Yes	43	42.2%
No	59	57.8%
Years of practice		
Less than 2 years	21	20.6%
2–5 years	28	27.5%
6–10 years	24	23.5%
11–15 years	17	16.7%
More than 15 years	12	11.8%
Location of practice		
Governmental hospital	81	79.4%
Private hospital	9	8.8%
Polyclinic	10	9.8%
Primary health care center	2	2.0%
Values are presented as numbers (n) and percentages (%).		

Table 2 - Physicians' responses regarding the incidence and effects of RHD and thumb CMC arthritis.

Questions	Score out of 5 on the Likert scale			P-value
	Family medicine (n=46)	Orthopedic surgeons (n=28)	Rheumatologists (n=28)	
Q1- Based on your current practice, how frequently are you seeing cases of RHD?	2.50 (2.00–3.00)	2.00 (2.00–3.00)	3.00 (3.00–4.75)	<0.001*
Q2- Based on your current practice, how frequently are you seeing cases of thumb CMC arthritis?	2.00 (2.00–2.00)	2.00 (2.00–3.00)	3.00 (3.00–4.00)	<0.001*
Q3- How much do you think that RHD affects patients' daily function?	4.00 (4.00–5.00)	4.00 (3.25–5.00)	5.00 (4.00–5.00)	0.783
Q4- How much do you think that thumb CMC arthritis affects patients' daily function?	4.00 (4.00–5.00)	4.00 (3.25–5.00)	4.00 (3.25–5.00)	0.868
Q5- Do you think that RHD is a cause of psychological distress to your patients?	4.00 (3.75–5.00)	4.00 (3.00–5.00)	4.50 (3.25–5.00)	0.493
Q6- Do you think that thumb CMC arthritis is a cause of psychological distress to your patients?	4.00 (3.75–5.00)	4.00 (3.00–4.00)	4.00 (3.00–5.00)	0.153

Note: Data are expressed as median and IQR. Q 1,2: Always = 5 / Often = 4 / Sometimes = 3 / Rarely = 2 / Never = 1. Q 3–6: Strongly agree = 5 / Agree = 4 / Neither agree nor disagree = 3 / Disagree = 2 / Strongly disagree = 1. *Statistical significance is set at $p<0.05$. RHD: rheumatoid hand deformity, CMC: carpometacarpal, IQR: interquartile range

responses regarding the management options for RHD and thumb CMC arthritis. Additionally, on assessing whether the length of physician experience affected the responses regarding management options, no significant differences were observed. However, on comparing the management practices between physicians with and without a subspecialty, physicians without a subspecialty were more likely to manage RHD patients with only systemic medications (median: 4.00 [IQR: 3.00–5.00] vs. median: 3.00 [IQR: 3.00–4.00], $p=0.014$). On the other hand, physicians with a subspecialty believed more strongly that hand surgery could help relieve pain in RHD cases (median: 4.00 [IQR: 3.00–5.00] vs. median: 3.00 [IQR: 3.00–4.00], $p<0.001$) and CMC arthritis cases (median: 4.00 [IQR: 4.00–5.00] vs. median: 3.00 [IQR: 3.00–4.00], $p<0.001$). Furthermore, physicians

with subspecialties also believed more strongly that hand surgery could help improve hand function in both RHD (median: 4.00 [IQR: 3.00–5.00] vs. median: 3.00 [IQR: 3.00–4.00], $p=0.001$) and CMC arthritis (median: 4.00 [IQR: 4.00–5.00] vs. median: 4.00 [IQR: 3.00–4.00], $p<0.001$). Physicians with subspecialties also believed more strongly that surgery could improve the cosmetic appearance of the hand, but the relationship was only significant in cases of RHD (median: 4.00 [IQR: 4.00–5.00] vs. median: 3.00 [IQR: 3.00–4.00], $p=0.036$).

Referral of RHD and thumb CMC arthritis patients.

The likelihood of referrals to hand surgeons for RHD patients was significantly higher among orthopedic surgeons (median: 4.50, IQR: 3.25–5.00) than among rheumatologists (median: 3.00, IQR: 2.00–4.00) and

Table 3 - Physicians' answers regarding the management options for RHD and thumb CMC arthritis.

Questions	Score out of 5 on the Likert scale			P-value
	Family medicine (n = 46)	Orthopedic surgeons (n = 28)	Rheumatologists (n = 28)	
Q7- Based on your current practice, are you managing RHD patients with systemic medications only?	3.00 (2.00–4.00)	3.00 (3.00–4.00)	4.00 (3.25–5.00)	0.010*
Q8- Based on your current practice, are you managing thumb CMC arthritis patients with systemic medications only?	3.00 (2.00–4.00)	3.00 (3.00–4.00)	4.00 (3.00–4.00)	0.483
Q9- Based on your current practice, are you offering RHD patients local steroid injections to the hand or wrist?	3.00 (2.00–4.00)	3.00 (2.00–4.00)	3.00 (2.00–4.00)	0.773
Q10- Based on your current practice, are you offering thumb CMC arthritis patients local steroid injections to the hand or wrist?	3.00 (2.00–4.00)	4.00 (3.00–4.00)	4.00 (2.25–4.00)	0.136
Q11- Based on your current practice, are you recommending the use of a hand brace or splint for RHD patients?	3.00 (2.75–4.00)	4.00 (3.00–5.00)	3.00 (2.25–4.00)	0.208
Q12- Based on your current practice, are you recommending the use of a hand brace or splint for thumb CMC arthritis patients?	3.00 (3.00–4.00)	4.00 (3.00–5.00)	3.00 (3.00–4.00)	0.098
Q13- Do you think that hand surgery can help with pain relief for some RHD patients?	3.00 (3.00–4.00)	4.00 (3.00–5.00)	3.00 (2.00–4.00)	0.007*
Q14- Do you think that hand surgery can help with pain relief for some thumb CMC arthritis patients?	4.00 (3.00–4.00)	4.50 (4.00–5.00)	3.00 (3.00–4.00)	<0.001*
Q15- Do you think that surgery can help some RHD patients improve their hand function?	4.00 (3.00–4.00)	4.00 (3.00–5.00)	3.50 (2.00–4.00)	0.086
Q16- Do you think that surgery can help some thumb CMC arthritis patients improve their hand function?	4.00 (3.00–4.00)	4.00 (3.25–5.00)	4.00 (3.00–4.00)	0.014*
Q17- Do you think that surgery can help some RHD patients improve the cosmetic appearance of their hands?	4.00 (3.00–4.00)	4.00 (3.25–5.00)	4.00 (3.00–4.00)	0.442
Q18- Do you think that surgery can help some thumb CMC arthritis patients improve the cosmetic appearance of their hands?	4.00 (3.00–4.00)	4.00 (3.00–4.00)	3.50 (3.00–4.00)	0.729

Data are expressed as median and IQR. Q7 -12: Very likely = 5 / Likely = 4 / Neutral = 3 / Unlikely = 2 / Very unlikely = 1. Q13-18: Strongly agree = 5 / Agree = 4 / Neither agree nor disagree = 3 / Disagree = 2 / Strongly disagree = 1. *Statistical significance is set at $p<0.05$. RHD: rheumatoid hand deformity, CMC: carpometacarpal, IQR: interquartile range

family medicine physicians (median: 3.00, IQR: 2.00–4.00) ($p<0.001$). A similar relation was observed in thumb CMC arthritis patients, with orthopedic surgeons demonstrating a significantly higher likelihood of referral (median: 4.50, IQR: 3.25–5.00) compared to rheumatologists (median: 3.00, IQR: 2.00–3.75) and family medicine physicians (median: 3.00, IQR: 2.00–4.00) ($p<0.001$). **Table 4** demonstrates the physicians' answers regarding the referral of RHD and thumb CMC arthritis patients. Moreover, we found that physicians who had a subspecialty were more likely to refer patients with RHD (median: 4.00 [IQR: 3.00–5.00] vs. median: 3.00 [IQR: 2.00–4.00], $p=0.003$) and those with thumb CMC arthritis (median: 3.00 [IQR: 3.00–5.00] vs. median: 3.00 [IQR: 2.00–4.00], $p=0.008$) to hand surgeons.

Among physicians who did not always refer their patients to hand surgeons ($n=75$, 73.5%), the most commonly reported reasons included patient resistance to surgery (26.7%), the belief that medical treatment was adequate (24%), the perception that surgical intervention lacked evidence in improving the patient's quality of life (20%), and a lack of awareness regarding available surgical options for managing these conditions (20%). However, on analyzing the reasons for each specialty separately, the most commonly reported reasons for not referring these patients among family medicine physicians were a lack of awareness regarding available surgical options for managing these conditions (32.5%), or the belief that medical treatment was adequate (30%). Furthermore, the most commonly

reported reasons for orthopedic surgeons were patient refusal (38.5%), the perception that there is a lack of evidence that surgical intervention improves the patient's quality of life (15.4%), or the belief that medical treatment was adequate (15.4%). Moreover, most rheumatologists reported that there is a lack of evidence that surgical intervention improves the patient's quality of life (50%) and that patients often refuse surgical options (27.3%). **Appendix 2** illustrates the reasons for not referring RHD and thumb CMC arthritis patients to hand surgeons among the different specialties. With respect to the physicians' preference for referring the patients, the majority reported that they either referred to plastic surgeons (52.9%) or hand surgeons specifically (4.9%). Additionally, 2 (2%) physicians said that they referred to both plastic and orthopedic surgeons. Approximately 40 (39.2%) physicians stated that they referred to orthopedic surgeons only, and one (1%) physician referred to orthopedic surgeons and neurologists. All 5 physicians who reported that they referred RHD and thumb CMC arthritis cases to hand surgeons had subspecialties.

Discussion. Although surgery can help improve the outcomes and quality of life of patients with RHD and thumb CMC arthritis, the referral rates to hand surgeons remain low in Saudi Arabia. The current study showed that orthopedic surgeons believe that surgical intervention improves function and decreases pain in patients with RHD, while a majority of rheumatologists and family medicine physicians considered medical

Table 4 - Physician response regarding the referral for RHD and thumb CMC arthritis patients.

Questions	Score out of 5 on the Likert scale			P-value
	Family medicine (n=46)	Orthopedic surgeons (n=28)	Rheumatologists (n=28)	
Q-19 Based on your current practice, are you referring RHD patients to physiotherapy?	4.00 (3.00–5.00)	4.00 (3.00–4.00)	4.00 (4.00–5.00)	0.186
Q-20 Based on your current practice, are you referring thumb CMC arthritis patients to physiotherapy?	4.00 (3.00–5.00)	4.00 (3.00–4.00)	4.00 (3.00–4.75)	0.482
Q-21 Based on your current practice, are you referring RHD patients to an occupational therapist?	4.00 (2.75–5.00)	4.00 (3.00–4.75)	4.00 (3.00–4.00)	0.950
Q-22 Based on your current practice, are you referring thumb CMC arthritis patients to an occupational therapist?	4.00 (2.00–5.00)	4.00 (3.00–4.75)	4.00 (3.00–4.00)	0.625
Q-23 Based on your current practice, are you referring RHD patients to a hand surgeon?	3.00 (2.00–4.00)	4.50 (3.25–5.00)	3.00 (2.00–4.00)	<0.001*
Q24- Based on your current practice, are you referring thumb CMC arthritis patients to a hand surgeon?	3.00 (2.00–4.00)	4.50 (3.25–5.00)	3.00 (2.00–3.75)	<0.001*

*Statistical significance is set at $p<0.05$. Data are expressed as median and IQR. Q19-24: Very likely = 5 / Likely = 4 / Neutral = 3 / Unlikely = 2 / Very unlikely = 1, RHD: rheumatoid hand deformity, CMC: carpometacarpal, IQR: interquartile range,

treatment sufficient for these patients. Therefore, unsurprisingly, referral rates to hand surgeons were significantly lower among family medicine physicians and rheumatologists than among orthopedic surgeons. This study is significant, as it clarifies the potential disparities and challenges in referral practices among different medical specialties. Additionally, the results provide valuable insights into the possible barriers faced by physicians when referring patients with RHD and thumb CMC arthritis to hand surgeons in Saudi Arabia. A study conducted in the USA showed similar results in terms of the attitudes of hand surgeons and rheumatologists toward the effectiveness of joint arthroplasty for improving function and pain reduction outcomes of patients with RHD.¹⁸ Several studies have demonstrated the efficacy of surgical interventions in improving function and reducing pain in patients with RA. Procedures, such as synovectomy and tenosynovectomy, particularly in early RA stages, have been shown to enhance joint function by eliminating inflamed synovial tissue and preventing tendon rupture, thereby reducing pain through sensory denervation. Surgical interventions performed on the distal radioulnar joint, such as Darrach, Sauve-Kapandji, and ulnar head arthroplasty, restore joint stability and alleviate pain resulting from subluxation and inflammation. In advanced RA stages, partial wrist arthrodesis preserves wrist motion and enhances hand function, while total wrist arthroplasty offers patients preferred wrist motion, effectively relieving pain.^{16,23-25}

In our study, it was observed that rheumatologists frequently employed systemic drugs as the primary management approach for patients with RHD. In contrast, orthopedic surgeons and family medicine physicians utilized systemic drugs at a comparatively lower rate in the management of these patients. A similar association was observed in patients with thumb CMC arthritis. A study in the UK found that rheumatologists may consider referrals to hand surgeons in cases where medical management failed. However, they found a notable decline in the need for surgical intervention, as rheumatologists started introducing disease-modifying medications earlier in the disease process, which reduced the number of cases with deformities.²⁶

These findings indicated that the current medications and therapeutic strategies can significantly improve disease control. Although systemic treatment with the current generation of anti-rheumatic medicines is crucial for controlling RA, once hand deformities or joint destruction occur, medications alone cannot modify or reverse these outcomes.

Orthopedic surgeons demonstrated a notably higher likelihood of referring patients with RHD and thumb CMC arthritis to hand surgeons than non-surgical physicians, including rheumatologists and family medicine physicians; this may reflect an inherent bias among surgeons toward surgical management. Moreover, it could be related to having a smaller and more selective patient group presenting to orthopedic surgeons with more severe RHD and thumb CMC arthritis. Notably, a survey conducted by Franzblau LE et al²¹ showed that compared to hand surgeons, rheumatologists were more doubtful about the effectiveness of surgical procedures, possibly obstructing the referral process. To ensure optimal patient care, physicians across all specialties should be well-informed about the appropriate specialists that should be consulted for RHD and thumb CMC arthritis. Lack of knowledge and misinformation can prevent patients from receiving appropriate medical care.

Almost a quarter of the respondents who disagreed with referring their patients to hand clinics believed that medical treatment was as effective as surgical interventions. One-fifth felt that evidence supporting surgical choices for treating RHD and thumb CMC arthritis is lacking. Conveying inconsistent information to patients can lead to confusion, distrust, and dissatisfaction. In a 2018 study that surveyed rheumatologists and surgeons in China, 80% of the respondents from both specialties felt that they had inadequate exposure to the other specialty during their training and that their exposure to RHD was insufficient; this suggests a lack of communication and knowledge sharing between specialties in a disease that requires a multidisciplinary team approach.²¹ Therefore, increasing the providers' knowledge of typical hand deformities will enhance primary care and make identifying issues requiring earlier surgical referrals easier.

Our study found that 26.7% of patients refused a referral to hand surgeons. In contrast, in a study in China, nearly half of the patients were interested in pursuing surgery. The main concerns reported regarding surgery were effectiveness, cost, and possible complications.¹⁸ Various factors, including cultural and geographical differences, such as limited awareness of surgical management for RHD and financial costs, can influence the referral rate. For example, cultural attitudes toward healthcare and treatment preferences may vary across regions within the country. In some areas, there may be a strong preference for conservative management due to cultural norms or beliefs that emphasize traditional healing practices over surgical

interventions. While in other regions, there may be greater acceptance of surgical interventions influenced by modern medical practices and exposure to diverse healthcare options. Geographical factors, such as access to healthcare facilities and availability of specialized services, can also impact referral patterns. Rural areas with limited access to hand surgeons may have lower referral rates than urban centers with well-established healthcare infrastructure. Additionally, socioeconomic factors, such as income level and insurance coverage, may play a role in the patients' ability to access surgical care. Notably, the majority of our sample worked in well-funded government hospitals providing free healthcare services, suggesting that the challenge might be more strongly associated with awareness and practice behaviors rather than with the financial burden. However, many easy and cost-effective solutions, such as distributing written brochures and organizing routine educational campaigns for arthritis patients and physicians, have been shown to improve patient understanding and awareness of the medical condition, along with the different treatment options, ultimately improving patient outcomes.²⁷⁻²⁹

Lastly, our study demonstrated that subspecialized physicians were more likely to recognize the benefits of surgical interventions for pain relief and functional improvement and that they have a higher referral rate of RHD and thumb CMC cases to hand surgeons. This finding aligns with that of Dastoury et al,³⁰ who found that sub-specialization enhances physician awareness and competency in practice. This suggests that subspecialty training significantly influences management practices, highlighting the importance of this training in optimizing patient outcomes.

Study limitations. Our study did not identify the reasons for patient refusal of hand surgery referrals. The survey's distribution method may have introduced selection bias, originating from contacting hospital departments separately. Additionally, the study did not delve into the physicians' perspectives on specific scenarios, leaving room for undefined factors that could potentially influence their opinions. Future research should investigate patient hesitancy toward surgery in order to develop strategies for informed decision-making and improved outcomes. Lastly, because the questionnaire was delivered to departments and then distributed to individual physicians, we could not track which physicians responded and which did not. Consequently, we could not calculate the exact response rate.

In conclusion, our findings revealed significant disparities in referral patterns for RHD and thumb

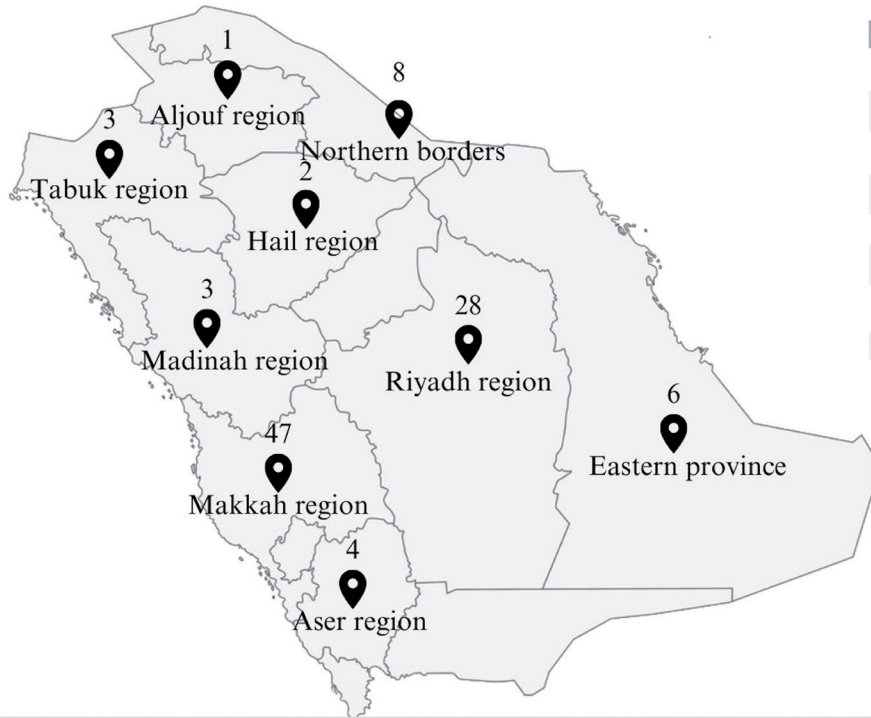
CMC arthritis patients to hand surgeons in Saudi Arabia, particularly highlighting differences among medical specialties. Orthopedic surgery is the primary referral specialty. Despite the availability of various surgical methods for treating these conditions, our study reveals that referral rates to hand surgeons remain low in the Saudi healthcare system. This discrepancy underscores potential barriers within the system that hinder optimal patient care. The main barriers identified include patient resistance to surgery, the perception among physicians that medical treatment alone is sufficient, and a lack of awareness regarding available surgical options for managing RHD and thumb CMC arthritis. To address these issues, we recommend implementing educational programs for healthcare professionals and patient education campaigns to increase awareness of surgical options and their benefits. Establishing standardized referral protocols will ensure appropriate referrals to hand surgeons. Additionally, further research should estimate actual patient referral rates and explore barriers from the patient's perspective. Implementing these recommendations will help optimize referral practices, improve patient care, and enhance outcomes for individuals with RHD and thumb CMC arthritis in the Saudi healthcare system.

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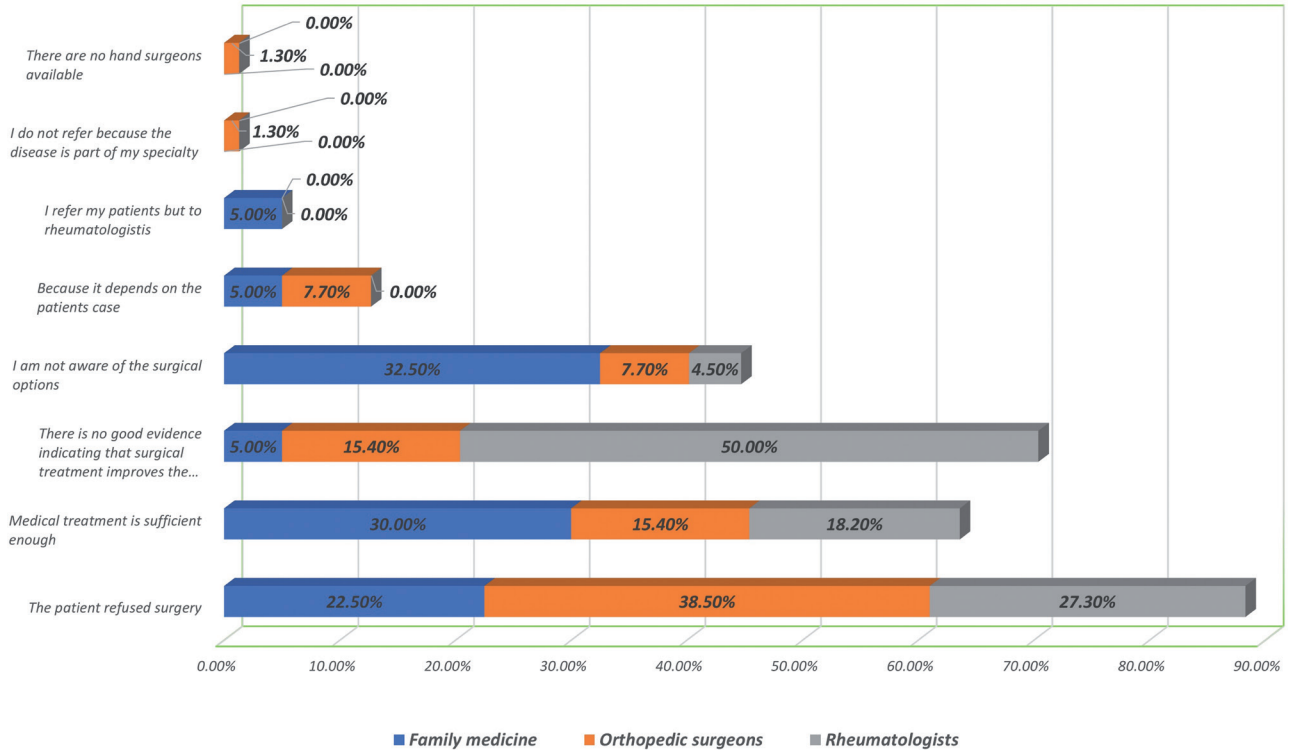
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Region	Population	Institutions contacted
Riyadh region	8,591,748	9
Makkah region	8,021,468	10
Eastern Province	5,125,254	1
Madina region	2,137,983	2
Asir region	2,024,285	3
Tabuk region	886,036	1
Hail region	746,406	1
Aljoug region	595,300	1
Northern Borders	373,577	2

Appendix 1 - The geographical characteristics of the study participants.



Appendix 2 - Reasons for not referring the patients to hand surgeons among the different specialties.