



The rheumatology workforce in the Arab countries: current status, challenges, opportunities, and future needs from an ArLAR cross-sectional survey

Nelly Ziade^{1,2} · Ihsane Hmamouchi^{3,4} · Chafika Haouichat^{5,10} · Fatemah Baron⁶ · Sulaiman Al Mayouf⁷ · Nizar Abdulateef⁸ · Basel Masri⁹ · Manal El Rakawi¹⁰ · Lina El Kibbi¹¹ · Manal El Mashaleh¹² · Bassel Elzorkany¹³ · Jamal Al Saleh¹⁴ · Christian Dejaco^{15,16} · Fatemah Abutiban¹⁷

Received: 24 June 2023 / Accepted: 7 August 2023

© The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature 2023

Abstract

The Arab League of Associations for Rheumatology (ArLAR) Research Group (ARCH) conducted this study to investigate the number of current practicing rheumatologists in the Arab countries, to estimate the projected number of rheumatologists in 10 years, and to evaluate the current workload, practice profile, consultation waiting time, and geographical mobilities of these rheumatologists. This cross-sectional survey study was conducted in 16 Arab countries in two parts. The first survey was addressed nominally to national societies to estimate the current and projected workforce. The second was an anonymous e-survey elaborated by the study steering committee on the Google Forms platform and distributed to Arab rheumatologists using social media, WhatsApp, and mass e-mails to evaluate their practice. The mean number of rheumatologists in Arab countries was 0.84 per 100,000 inhabitants (mean age 47.5 years, 55% females), ranging from 0.06 (Sudan) to 1.86 (Tunisia). The number of rheumatologists is expected to increase by 50% in 2032. Nevertheless, a 20% increase in population associated with an increase in demand is also expected. Data from 446 rheumatologists (mean age 43.9 years, 60.5% females) revealed that 72% worked full-time, and 53% were employed in the public sector only. The average waiting time for a rheumatology consultation was 19.9 days. Of 394 rheumatologists, 19% obtained their rheumatology diplomas from non-Arab countries, and 47% of Gulf rheumatologists were non-citizen physicians. Considering local demographic disparities, healthcare system differences, and geographical mobilities, national authorities are advised to implement effective intervention plans to optimize the rheumatology workforce.

Keywords Workforce · Healthcare · Arab countries · Rheumatology

Introduction

The demand for rheumatology care is consistently exceeding the workforce worldwide, which is negatively impacting the care of patients with rheumatic and musculoskeletal diseases (RMDs) [1–7]. This global imbalance is expected to increase in the upcoming years. For instance, the 2015 American College of Rheumatology (ACR) Workforce Study projected

that by 2030, the number of adult rheumatology providers would decline by 25%, resulting in demand exceeding the supply by 102% in the USA [1]. This disproportion between the offer and the demand is also reported from other regions of the world, regardless of their economic levels, such as Europe [4, 6], Latin America [2], and South Asia [7]. This is even more pronounced in the field of pediatric rheumatology [1].

Several reasons might explain this imbalance. On one hand, the prevalence of RMDs is increasing due to the worldwide aging population and subsequent rise of age-related RMDs, the growing environmental risk factors, such as obesity, inadequate nutrition, and other lifestyle features, the novel diagnostic tools, early referral strategies, and treatment options which all result in the expansion of the pool of patients with RMDs requiring rheumatology care [8–11]. On

The manuscript was published as a preprint on researchsquare.com as: Nelly Ziade, Ihsane Hmamouchi, Chafika Haouichat et al. The ArLAR Rheumatology Workforce: Current Status, Challenges, Opportunities, and Future Needs, 26 June 2023, PREPRINT (Version 1) available at Research Square [<https://doi.org/10.21203/rs.3.rs-3104298/v1>].

Extended author information available on the last page of the article

the other hand, a significant proportion of rheumatologists are approaching retirement, and young physicians seem to have a low interest in rheumatology training [1–3]. Moreover, an additional reason in some low- and middle-income countries might be the exodus of young rheumatologists and fellows in rheumatology due to multiple reasons, including economic instability and lack of physician-protecting laws, leading to marked shortages in their home countries [7, 12–14].

Estimates of the current and projected status of the rheumatology workforce in Arab countries are lacking. Sixteen of these countries are members of the Arab League of Associations for Rheumatology (ArLAR), encompassing 384 million inhabitants [15]. Despite significant heterogeneity in their healthcare systems and socio-economic levels, these countries share one common language and almost similar cultural habits.

The ArLAR Research Group (ARCH) conducted this study to investigate the current number of practicing rheumatologists in the Arab countries, to provide an estimate of the expected number of rheumatologists in 10 years, and to evaluate the current workload, practice profile, waiting time for a consultation, and geographical mobilities of these rheumatologists.

Materials and methods

Study design

This descriptive cross-sectional study was conducted in 16 Arab countries, members of the ArLAR, i.e., Algeria, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, and United Arab Emirates (UAE).

For the current study, the term ‘rheumatology workforce’ encompasses rheumatologists and fellows in training in the field of rheumatology. The rheumatology nurses and assistants were not included due to the scarcity of data in this regard.

Current and projected workforce data

To evaluate the current and projected workforce, a survey elaborated by the study steering committee was addressed nominally by e-mail to each rheumatology national society (president, general secretary, and ARCH representative). Official data were requested, including the total number of registered adult and pediatric rheumatologists, gender, age, the total number of physicians per country, the retirement age of rheumatologists in the country, number of centers delivering rheumatology certification in the country, number of years required to obtain a rheumatology degree, number

of fellowship positions per year, number of graduated rheumatology fellows per year, and estimated percentage of the fellows who stay and practice in their respective countries after graduation. In most countries, society data accurately reflect the actual workforce as physicians and rheumatologists cannot practice without registering in their local society. Data on pediatric rheumatologists were cross-checked with the Pediatric Rheumatology Arab Group (PRAG), an ArLAR special interest group.

As for the projected number of rheumatologists in 10 years (2032), it was calculated as the sum of the current number of rheumatologists (in 2022) plus the expected number of graduated fellows in the upcoming 10 years as provided by the respective societies (which was multiplied by the percentage of those expected to stay and work in their respective countries) minus the number of rheumatologists who are expected to retire. Part-time rheumatologists were included in the analysis, as the exact percentage of work time could not be obtained.

Population estimates, serving as denominators, were retrieved from World Bank sources, Worldometer, and Statista websites for 2022 and 2032 [16–18].

Rheumatologists’ workload, practice profile, and geographical mobility

To evaluate the workload, practice profile, and geographical mobility of rheumatologists in the Arab regions, an e-survey developed by the study steering committee on the Google Forms platform was addressed in spring 2022 to all Arab rheumatologists and rheumatology fellows using the ArLAR social media accounts, the societies’ WhatsApp groups, and mass e-mails. The content of the survey was based on the literature review, previous ArLAR surveys among rheumatologists [19], and the points to consider published by the EULAR for the conduction of workforce requirements in rheumatology [20] and was pilot-tested by the study steering committee then on a sample of 10 rheumatologists and rheumatology fellows to ensure feasibility and understandability. Data included demographics (country of origin, of current practice, of medical diploma, of additional certification, additional training outside the country of initial diploma, age, gender, years of rheumatology practice), practice profile (work status (full/ part-time), work sector (public/ private/ both), practice setting (urban/ rural/ semi-urban/ mixed), involvement in research and/or academic activities, income range, presence of a certified nurse, musculoskeletal ultrasound (MSUS), and an infusion center at the rheumatology practice, use of telemedicine (synchronous audiovisual consultations, synchronous telephone consultations, and asynchronous consultations (e-mails and phone messages), workload (number of outpatients, of new outpatients, of hospitalized

patients, hours of work, hours spent with outpatients, in academic activities, in research, in administrative duties per week, waiting time for a rheumatology consultation, range of treated diseases), and job satisfaction (indirectly through asking if the rheumatologist would choose another career path if given a choice [13, 21]). Multiple submissions by the same respondent were prevented by recording the Internet Protocol (IP) address.

Statistical analysis

The data were presented descriptively using numbers and percentages, means and standard deviations (SDs), and medians and interquartile ranges (IQR) as appropriate, by country and by Arab region. The countries were grouped into three regions based on their geographical location as well as historical and cultural backgrounds: North Africa (Algeria, Egypt, Libya, Morocco, Sudan, Tunisia), Levant or Fertile Crescent (Iraq, Jordan, Lebanon, Palestine, Syria), and the Arabian Peninsula, commonly called the Persian Gulf region (Bahrain, Saudi Arabia, Kuwait, Qatar, Oman, UAE, Yemen) [22, 23]. In addition, countries within the same region have close socioeconomic levels and healthcare systems. A comparison of the rheumatologists' characteristics between the three Arab regions was performed using chi-square and ANOVA as appropriate.

The primary outcome was the current number of rheumatologists per 100,000 inhabitants. The secondary outcomes were the projected number of rheumatologists in 2032, the practice profile, the current workload of rheumatologists in terms of working hours, the median waiting time for a rheumatology consultation, job satisfaction (defined as rheumatologists who would choose rheumatology again as a career if given a choice today), and the percentage of rheumatologists practicing per country compared to the native rheumatologists (qualitative comparison).

Predictors of median waiting time (waiting time in days was transformed into a binary variable using the median as a cut-off) and job satisfaction were identified using a logistic binary regression multivariable analysis.

A *p* value < 0.05 was regarded as statistically significant. Statistical analysis was performed with SPSS v23.0.

The study was approved by the Ethics Committee of Saint Joseph University, Beirut (CEHDF 1661) and by the Institutional Review Boards of the participating countries as per local requirements.

The data collection and reporting followed the points to consider published by the EULAR for the conduction of workforce requirements in rheumatology [20]. The study adhered to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [24].

Results

Current workforce

Data were collected from all 16 Arab countries. Seven countries (Iraq, Jordan, Kuwait, Lebanon, Libya, Palestine, Sudan) agreed to provide raw data in the form of Excel sheets, where individual rheumatologist information (including age and gender) was available. The other nine countries (Algeria, Egypt, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, UAE) agreed to provide only summary data, including the total number of rheumatologists registered in the society, their gender distribution, and their average age.

There were 3227 registered rheumatologists, indicating an average of 0.84 per 100,000/inhabitants (Table 1). A substantial heterogeneity was observed among the countries, with the number of rheumatologists ranging from 0.06 in Sudan to 1.86 per 100,000 inhabitants in Tunisia. Compared to the total number of physicians, the average number of rheumatologists was 2.9 per 1000 physicians and ranged from 1.1 in Syria to 36.4 in Kuwait. The mean age of rheumatologists was 46.8 years [SD 11.5], highest of 55 years in the UAE, and lowest in Morocco and Saudi Arabia of 40 years. Fifty five percent (1779/3227) of rheumatologists were females, ranging from 9.2% of rheumatologists in Palestine to 71.1% of rheumatologists in Morocco.

Notably, heterogeneity was observed when considering the three Arab regions (Table 2). The lowest number of rheumatologists per 100,000 inhabitants was observed in the Levant countries (0.52) and the highest in North Africa (0.96). However, the Levant had the highest number of rheumatologists/1,000 physicians (2.77), whereas the Gulf countries had the lowest (1.22). Also, the percentage of female rheumatologists was the lowest in the Persian Gulf countries (29.0%) and the highest in North Africa (63.1%).

Projected workforce in 2032

Based on data from the seven countries that provided raw data with detailed age lists, and using the local retirement age, the annual number of graduated fellows, and the percentage of fellows who are expected to stay in their respective countries after graduation, the crude number of rheumatologists in 2032 is expected to increase by 50.1% (from 433 to 653 active rheumatologists) (Tables 3, 4).

During the same period, a 20% increase in the population is also expected [17, 18]. As a result, the number of rheumatologists per 100,000 inhabitants will increase from 0.37 to 0.45 in the evaluated countries (only a 22%

Table 1 Rheumatology workforce in the Arab countries in 2022, by country, presented by geographical region and decreasing ratio of rheumatologists / 100,000 inhabitants (based on data provided officially by the national societies)

Continent	Country	Number of rheumatologists	Number of men (%)	Number of women (%)	Average age	Retirement age	Country population	Rheumatologists/ 100,000 inhabitants	Total number of physicians	Number of rheumatologists/ 1,000 physicians	Number of physicians/ 100,000 inhabitants
North Africa	Tunisia	220	64 (29.1)	156 (70.9)	48.8	65	11,820,000	1.86	15,366	14.3	130.0
	Egypt	1200	384 (32.0)	816 (68.0)	NA	70	102,300,000	1.17	445,000	2.7	435.0
	Algeria	505	293 (58.0)	212 (42.0)	NA	70	43,850,000	1.15	425,700	1.2	970.8
	Morocco	380	110 (28.9)	270 (71.1)	40	No limit	36,910,000	1.03	25,837	14.7	70.0
	Libya ^a	18	6 (33.3)	12 (66.7)	48.3	65	6,871,000	0.26	14,429	1.2	210.0
	Sudan ^a	25	9 (36.0)	16 (64.0)	47.7	65	43,850,000	0.06	11,480	2.2	26.2
Gulf	United Arab Emirates	104	NA	NA	55	65	9,890,000	1.05	10,000	10.4	101.1
	Kuwait ^a	40	23 (57.3)	17 (42.5)	46.7	70	4,271,000	0.94	1100	36.4	25.8
	Qatar	27	18 (66.7)	9 (33.3)	47.5	65	2,881,000	0.94	7203	3.7	250.0
Levant	Saudi Arabia	261	165 (63.2)	96 (36.8)	40	62	34,810,000	0.75	10,000	26.1	28.7
	Oman	30	18 (60.0)	12 (40.0)	NA	60	5,107,000	0.59	9703	3.1	190.0
	Lebanon ^a	56	36 (64.3)	20 (35.7)	54.3	No limit	6,800,000	0.82	16,500	3.4	242.6
	Iraq ^a	246	156 (63.4)	90 (36.6)	44.9	63	40,220,000	0.61	38,865	6.3	96.6
	Syria	67	25 (37.3)	42 (62.7)	50	60	17,500,000	0.38	60,000	1.1	342.9
	Jordan ^a	37	27 (73.0)	10 (27.0)	46	60	10,200,000	0.36	28,000	1.3	274.5
	Palestine ^a	11	10 (90.9)	1 (9.1)	48.1	60	4,803,000	0.23	7000	1.6	145.7
Total		3,227	1344 (41.6)	1779 (55.1%)	46.8 [SD 11.5]	64.29	382,083,000	0.84	1,126,083	2.9	294.7

^aCountries who provided raw data, otherwise data were provided by the societies as means and percentages for age and gender, respectively

Table 2 Rheumatology workforce in the Arab countries in 2022, by geographical region (based on data provided officially by the national societies)

Region	Number of rheumatologists	Number of rheumatologists (%)	Number of men	Number of women (%)	Average age [SD]	Retirement age	Population	Rheumatologists/100,000 inhabitants	Total number of physicians	Number of rheumatologists/1000 physicians	Number of physicians/100,000 inhabitants
North Africa	2348	866 (36.88)	1482 (63.12)	1482 (63.12)	46.2	67	245,601,000	0.96	937,812	2.50	381.8
Gulf	462	224 (48.48)	134 (29.00)	134 (29.00)	47.3	64.4	56,959,000	0.81	37,906	1.22	66.5
Levant	417	254 (60.91)	163 (39.09)	163 (39.09)	48.66	60.75	79,523,000	0.52	150,365	2.77	189.1
Total	3227	1344 (41.6)	1779 (55.1)	1779 (55.1)	46.85 [11.52]	64.29	382,083,000	0.84	1,126,083	2.87	294.7

increment). This increase, even if extrapolated to the 16 Arab countries (0.84 to 1.02 rheumatologists/ 100,000 inhabitants), would not match the increasing needs of the aging population in the best figures, as the desirable conservative target range is 1–2/100,000 [4, 25], particularly when taking into account the growing demands for rheumatology care due to the increased life expectancy and enhanced population expectations from the healthcare system particularly in context to RMDs.

Practice profile and workload

For the second part of the study, a total of 459 participants responded to the e-survey (14.2% of the registered rheumatologists in the Arab countries). Participants who identified as non-physicians (one pharmacist), retired (one), and those with inconsistent or missing values (12) were excluded. Therefore, 445 participants were included in the current analysis (367 adult rheumatologists, 27 pediatric rheumatologists, and 51 rheumatology fellows). Their mean age was 43.8 years [SD 11.48], 60.7% were females (38.9% males and 0.4% preferred not to say), and the average rheumatology practice duration was 13.8 years [SD 10.8].

Rheumatologists reported practicing as full-timers in 71.7%, in a public setting in 52.8% (mixed public and private in an additional 28.8%), and mostly in an urban setting in 75.0% (all higher in the Gulf, $p < 0.001$). They reported a median income of 1000–2000 USD/ month (higher in the Gulf, $p < 0.001$, higher for full-time physicians, $p < 0.001$ and in private practice, $p = 0.005$) and used their personal phone for medical consultations in 90.2% (more in North Africa, $p = 0.015$). Available facilities at the rheumatology practice were an infusion center in 64.3%, MSUS in 51.2%, and audiovisual teleconsultation in 28.5% (all highest in the Gulf, $p < 0.001$). In addition, there was a specialized rheumatology nurse in the rheumatology centers in 24.7% (highest in the Levant, $p < 0.001$) (Table 5).

On average, and on weekly basis, rheumatologists reported working 34.4 h, 27.5 h with patients (hospitalized and outpatients), and 18.8 h with outpatients (highest in the Gulf). They saw 54.3 outpatients, including 21.4 new patients (highest in the Levant, $p < 0.001$). The number of hospitalized patients under their care was 4.8 (highest in the Levant, $p = 0.041$). An average of 21.5 min was spent on a medical consultation, 28.0 min for new patients, and 15.8 min for follow-up patients (highest in the Gulf, $p = 0.007$). In addition, the rheumatologists reported spending 5.5 h per week on academic activities (like teaching and student mentoring) ($p = 0.875$ among the three regions), 3.8 h on research activities (highest in North Africa, $p = 0.015$), and 3.5 h on administrative activities (highest in the Gulf, $p = 0.008$). Also, they spend 4.8 h on audiovisual teleconsultation, 4.8 h on synchronous teleconsultation

Table 3 Current rheumatology workforce in the Arab Countries in 2022, by country (based on the official raw data from 8 countries)

Country	2022					
	Number of rheumatologists	Average age	Retirement age	Country population	Median population age	Rheumatologists /100,000 inhabitants
Iraq	246	44.9	63	40,220,000	21.0	0.61
Jordan	37	46.0	60	10,200,000	23.8	0.36
Kuwait	40	46.7	70	4,271,000	36.8	0.94
Lebanon	56	54.3	75	6,800,000	29.6	0.82
Libya	18	48.3	65	6,871,000	28.8	0.26
Palestine	11	48.1	60	4,803,000	20.8	0.23
Sudan	25	47.7	65	43,850,000	19.7	0.06
Total	433	46.9	65.4	117,015,000	25.8	0.37

Table 4 Projected 2023 rheumatology workforce in the Arab Countries, by country (based on the official raw data from 8 countries)

Country	2032					
	Rheumatologists who have retired	New rheumatologists ^a	Number of rheumatologists	Country population	Median population age	Rheumatologists /100,000 inhabitants
Iraq	65	108	289	52,236,541	23.6	0.55
Jordan	6	50	81	10,857,672	28.4	0.75
Kuwait	3	25	62	4,833,716	37.1	1.28
Lebanon	13	10	53	6,190,354	36.5	0.86
Libya	5	50	63	7,727,511	32.9	0.82
Palestine	3	20	28	6,593,042	23.0	0.42
Sudan	4	56	77	57,708,034	22.0	0.13
Total	99	319	653	146,146,870	29.1	0.45

^aThe number of new rheumatologists is calculated as the number of graduated rheumatology fellows per year for 10 years, multiplied by the estimated percentage of fellows in stay and practice in their respective countries

Median population age source: Worldometer (2022) + Statista (2032)

Country population 2032: Our world in data

(phone), and 3.9 h on asynchronous consultation (e-mails, phone messages) (Table 6).

The average waiting time for a rheumatology consultation was 19.9 days, with high fluctuations ranging from 0 to 300 days. It was highest in the Gulf (25.6 days) and lowest in the Levant (9.5 days) ($p < 0.001$) (Table 6). A longer waiting time was associated with the region of practice (longer in the Gulf and North Africa, shorter in the Levant), the work status (full-time), the work sector (public), the monthly income (higher), and the presence of an infusion center at the rheumatology practice (Supplementary Table 1).

The diseases treated by rheumatologists were diverse, ranging from chronic inflammatory rheumatic diseases (96.9%) to neoplastic musculoskeletal diseases (43.3%), and including fibromyalgia (91.3%), vasculitis (75.8%),

mechanical rheumatic diseases (89.2%), osteoporosis (88.8%) and infrequent diseases such as Behcet's (88.6%) and auto-inflammatory diseases (78.5%) (Supplementary Table 2).

Job satisfaction

If given a choice, 68.2% of the respondents would choose a rheumatologist career again (300/ 440), 12.3% would choose a different specialty, and 19.5% were unsure (no differences among the three Arab regions, $p = 0.341$). Among the responders who would choose a career other than rheumatology: 82 (47.2%) would select a different medical specialty, 28 (16.5%) a job in research, 28 (16.5%) nothing related to medicine, 23 (13.5%) a surgical specialty, 6 (3.5%) an

Table 5 Practice profile of rheumatologists in the Arab countries (based on a cross-sectional survey completed by 445 rheumatologists)

Practice profile	All		North Africa		Levant		Gulf		p value
	N	%	213	%	157	%	74	%	
Work status									
Full-time	319	71.7	156	73.2	92	58.6	70	94.6	<0.001
Part-time	123	27.6	57	26.8	62	39.5	4	5.4	
Work sector									
Public	235	52.8	115	54.0	68	43.3	52	70.3	0.001
Private	82	18.4	40	18.8	29	18.5	13	17.6	
Both	128	28.8	58	27.2	60	38.2	9	12.2	
Work setting									
Urban	333	74.8	166	77.9	99	63.1	67	100	<0.001
Semi-urban	12	2.7	0	0	1	1.3	0	0	
Rural	2	0.4	10	4.7	2	0.6	1	0	
Mixed	93	20.9	33	15.5	54	34.4	6	0	
Average monthly income USD/month									
< 1000	157	35.3	93	49.5	63	40.1	0	0	<0.001
1000–2000	83	18.6	50	23.5	32	20.4	1	1.4	
2001–5000	83	18.6	36	16.9	38	24.2	9	12.2	
5001–10,000	39	8.8	4	2.1	6	4.3	29	45.3	
> 10,000	31	7.0	5	2.7	1	0.7	25	39.1	
Use of the personal phone for medical consultation									
Yes	257	57.8	134	63.8	80	52.3	43	58.9	0.015
Sometimes	144	32.4	64	30.5	61	39.9	18	24.7	
No	36	8.1	12	5.7	12	7.8	12	16.4	
Presence of musculoskeletal ultrasound in practice,									
Performed by	228	51.2	124	60.8	46	30.5	57	78.1	<0.001
Rheumatologist	129	56.6	86	69.3	9	19.6	34	59.6	
Radiologist	46	20.2	14	11.3	23	50	8	14.0	
Both	42	18.4	21	16.9	9	19.6	12	21.0	
Presence of a certified rheumatology nurse in the practice	110	24.7	43	21.2	56	36.8	11	15.5	0.001
Presence of an infusion center in the practice	286	64.3	109	56.2	111	72.5	66	89.2	<0.001
Implementation of audiovisual teleconsultation in the practice	127	28.5	42	20.1	49	32.2	36	48.6	<0.001

Significantly higher numbers among the three regions are indicated in bold

administrative job and 3 (1.8%) a job in the pharmaceutical industry. Female gender and the availability of an infusion center at the rheumatology practice were independently associated with job satisfaction (Supplementary Table 3).

Geographical mobility of rheumatologists

Of 394 participants (rheumatology fellows excluded), only 8 were originally from non-Arab countries (2.0%). In addition, 32 obtained their general medicine diploma from non-Arab countries (8.1%) and 76 rheumatologists (19.3%) obtained their rheumatology diplomas from non-Arab countries. Nevertheless, 123 rheumatologists (31.2%) reported having some additional rheumatology training outside their country of origin: 83 (21.1%) in Europe, 14 (3.6%) in North

America, 4 (1.0%) in Eastern Europe, 2 (0.5%) in Australia (rest is unspecified). The average duration of training was 18.6 months [SD 22.6]. In addition, 47% of Gulf rheumatologists were non-citizen physicians indicating that some Gulf countries appeal non-citizen rheumatologists (UAE, Qatar and Saudi Arabia), essentially from the Levant and North Africa (Supplementary Tables 4 and 5, Fig. 1).

Discussion

Significant heterogeneity in the current rheumatology workforce was observed among the Arab countries, ranging from an extremely low (0.06 rheumatologists per 100,000 inhabitants) in Sudan to a much acceptable level

Table 6 Average workload of rheumatologists in the Arab countries (based on a cross-sectional survey completed by 445 rheumatologists)

Workload	All		North Africa		Levant		Gulf		p value
	N	SD	N	SD	N	SD	N	SD	
	445		213		157		74		
Number of work hours per week	34.4	20.3	32.9	19.4	32.4	20.7	43.1	19.8	<0.001
Number of work hours with patients per week	27.5	16.3	25.0	16.3	29.2	16.8	30.8	14.7	0.007
Number of work hours with outpatients per week	18.8	16.9	16.6	19.1	19.5	14.5	22.6	14.3	0.026
Number of outpatient visits per week	54.3	51.2	41.5	40.6	74.2	62.3	47.2	37.7	<0.001
Number of new outpatients' visits per week	21.4	22.1	16.8	17.8	31.8	26.6	12.4	12.8	<0.001
Time spent on a single outpatient visit (minutes)	21.5	13.6	22.6	14.1	18.8	13.3	24.2	12.2	0.007
Time spent on a single new outpatient visit (minutes)	28.0	13.1	28.9	13.8	23.6	10.8	34.4	12.1	<0.001
Time spent on a single follow-up outpatient visit (minutes)	15.8	8.4	16.5	7.9	13.5	6.8	18.6	11.3	<0.001
Number of hospitalized patients per week	4.8	13.5	4.5	7.4	6.8	20.8	1.8	2.1	0.041
Time consecrated for the work sector									
Hours for the public sector	24.2	20.3	24.2	19.6	20.4	18.2	32.5	23.8	<0.001
Hours for the private sector	11.5	17.8	9.7	16.1	15.1	19.9	9.2	16.9	0.009
Time spent in academic activities like teaching and student training (hours per week)	5.5	7.3	5.3	7.7	5.7	6.3	5.7	8.2	0.875
Time spent in research activities (hours per week)	3.8	6.4	4.6	7.5	2.7	4.6	3.9	5.8	0.015
Time spent in administrative activities (hours per week)	3.5	7.4	2.7	5.1	3.7	9.3	5.8	8.3	0.008
Hours of audiovisual teleconsultation per week	4.8	5.51	4.7	6.9	3.4	3.7	3.3	4.5	0.437
Hours of synchronous teleconsultation per week (phone)	4.8	5.5	4.0	–	2.4	1.7	8.1	7.9	0.334
Hours of asynchronous telemedicine per week	3.9	2.0	6.0	–	3.4	2.2	4.0	1.8	0.536
Waiting time for the rheumatology visit (days)	19.9	34.7	25.5	40.6	9.5	17.4	25.6	38.9	<0.001

Significantly higher numbers among the three regions are indicated in bold

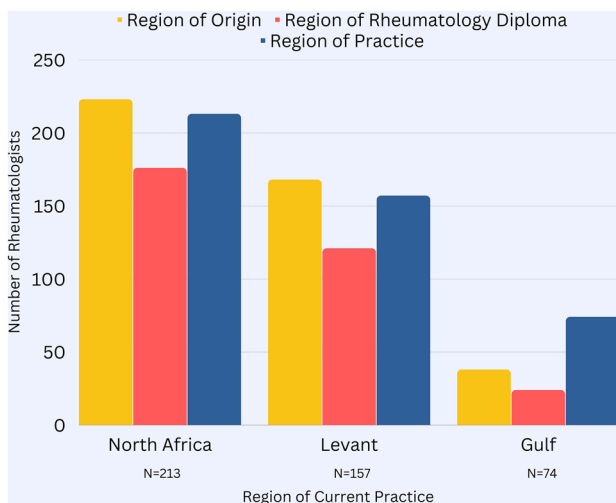


Fig. 1 Number of rheumatologists per region of origin, of rheumatology diploma, and of current practice (based on a sample survey of 394 rheumatologists)

(1.86 per 100,000 inhabitants) in Tunisia. This considerable heterogeneity is probably related to differences in healthcare and education systems, in addition to the countries' economic levels. Nevertheless, the global number of 0.84 rheumatologists per 100,000 inhabitants is still below

the arbitrarily desirable level of 1–2 rheumatologists per 100,000 [4, 25]. It falls behind the numbers reported by others such as Spain (3.44), the USA (1.74), Canada (1.42), the UK (1.02), and Latin America (0.94) [1, 6, 26, 27]. The disparities in the number of rheumatologists among countries do not seem to mirror trends in total physicians per country. For instance, the five countries with the highest number of rheumatologists (> 1 per 100,000 inhabitants) have a range of total physicians of 70–971 per 100,000 inhabitants.

Moreover, the projected increase in the workforce in 10 years (an increase of the crude number of rheumatologists by around 50%) would still be insufficient to match the quantitative (increase in population by around 20%) and qualitative increase in demand (increase of the prevalence of patients with RMDs due to multiple lifestyle risk factors, improvement in diagnostic and therapeutic tools, and rising life expectancy of patients with RMDs much further), as it will not reach the above-mentioned arbitrary desirable level.

Furthermore, the female-to-male rheumatologist ratio is very high in some countries and is expected to rise in the future [28]. This might raise some concerns for the workforce in general as the ACR workforce study showed that women rheumatologists tend to work more as part-time physicians compared to their male counterparts [1], yet, this

was not observed in the current study. The high discrepancy in female/ male ratios observed among countries might be explained by differences in education systems or cultural habits and highlight the importance of taking local demographics into account when assessing the workforce.

Despite this apparent workforce shortage, the average waiting time for a rheumatology consultation, i.e., 19.9 days in the current study, is relatively acceptable. Although the waiting time ranged widely from 0 to 300 days, the average was still shorter than the one observed in other regions of the world, which is typically over two months [29–32]. This potential efficiency in rheumatology care might be related to multiple factors, including the high prevalence of private practices (47.2%), availability of the rheumatologist over the phone (90.2% accept to use their personal phones for a medical consultation, which might decrease the need for some patients to go to the clinic), late retirement age with even no limit in some countries, and self-referral of patients to rheumatology (most countries do not have a mandatory transit through a primary care physician). However, and in the absence of indicators of lower prevalence of RMDs in the Arab countries, the seemingly lower waiting time might also indicate a lack of proper referral of the patients with RMDs to the rheumatologist, as other specialists, such as internists or orthopedic surgeons, might see them. This possible low referral of patients with RMDs should be addressed further in future dedicated studies.

Additionally, the current study provided insights on how to optimize the current rheumatology workforce. Now equipped with concrete figures and targets from the current study, societies must urge local health and education authorities to increase the number of rheumatology trainees. For example, based on the current and projected number of rheumatologists, societies could estimate the number of new rheumatologists needed in 10 years to reach a target of 1–2 rheumatologists / 100,000 inhabitants. Also, training rheumatology nurses and qualified assistants would also support the rheumatology workforce and improve its efficiency [3]. Moreover, proper motivation should be provided to decrease the exodus of young rheumatologists from countries with lower and/or unstable socio-economic conditions by improving their working situations. For example, in some countries like Egypt, the lack of laws that protect physicians from verbal offense and even allowing to send them to jails just upon accusation of malpractice, has been a major reason for the immigration of young physicians in the past 5 years, and should be addressed seriously.

The strengths of the present work are the large sample size and being the first of its kind to our knowledge. Furthermore, although the study aimed to address unmet needs, some specific positive findings were found worth citing. Many rheumatologists were trained locally, and work regionally and this could enhance the regional collaboration.

Also, the use of ultrasound by more than 50% of respondents might be an indicator of high-quality rheumatology care and continuous medical training.

There are, however, some limitations. The population to which surveys are distributed cannot be clearly described, and their demographic data might not be validated, as would happen in anonymous surveys. Respondents with biases cannot be ruled out. The survey being distributed via online platforms would necessarily reflect those who are online-oriented and not necessarily the wider rheumatology community. Also, rheumatology fellows included in the second part of the survey might not complete their training or practice rheumatology in the future. Another specific limitation of the current study was the inclusion of part-time rheumatologists in the workforce estimation without considering the number of full-time equivalents (FTEs), which probably induced an overestimation of the current and future workforce. Although 27.6% reported working part-time, the actual percentage of working time was not available to calculate FTEs. Moreover, some Arab countries have a 5-days working week whereas other have a 6-days working week, which adds to the heterogeneity among countries. Additional limitations for the projected workforce are the indirect evaluation of job satisfaction, the lack of raw data from nine out of 16 countries and the calculation of the workforce demand based solely on the population's age. Except for a few studies [10, 11, 33], a precise estimation of the prevalence of the RMDs in the region is not available; therefore, the demand increase might have been underestimated in the current study.

In conclusion, the number of rheumatologists in the Arab countries is currently estimated to be 0.84 per 100,000 inhabitants, indicating a shortage in the rheumatology workforce when compared to the desirable threshold of 1–2 rheumatologists per 100,000 inhabitants, with significant heterogeneity among the countries. The projected increase in rheumatologists will undoubtedly not match the rising demand for rheumatology care. The relatively acceptable waiting time for a consultation (19.9 days) might indicate a lack of proper referral to rheumatology and should be addressed in further dedicated studies. Considering the local demographic disparities, healthcare system differences, and geographical mobilities, national health and education authorities are advised to implement effective intervention plans to expand and optimize the rheumatology workforce to meet the growing demand.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s00296-023-05427-x>.

Acknowledgements We acknowledge the contribution of the following rheumatologists for providing data about their respective societies: Drs Samar Al Emadi, Ayman Al Garf, Khaled Al Naqbi, Walaa Abdel

Rahman, Hanan Al Rayes, Rachid Bahiri, Elyes Bouajina, Hachemi Djoudi, Suad Hashad, Batool Hassan, Layla Kazkaz, Suad Mohamed.

Author contributions NZ and IH designed the study and performed the statistical analyses. CD provided an expert opinion about the study methodology and the discussion of the obtained results. NZ wrote the initial manuscript draft. All the authors made substantial contributions to the design of the work, pilot-tested the questionnaire, and helped in the acquisition of the data in their respective countries. All authors participated in the interpretation of data for the work; and reviewed the work for important intellectual content. All authors approved the final submitted version and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Funding None.

Data availability Data can be available upon reasonable request to the corresponding author.

Declarations

Conflict of interest None related to this manuscript.

Ethical approval The study was approved by the Ethics Committee of Saint Joseph University, Beirut (CEHDF 1661), at the central site of the study.

References

- Battafarano DF, Ditmyer M, Bolster MB et al (2018) 2015 American College of Rheumatology workforce study: supply and demand projections of adult rheumatology workforce, 2015–2030. *Arthritis Care Res* 70:617–626. <https://doi.org/10.1002/acr.23518>
- Fernández-Ávila DG, Patino-Hernandez D, Kowalskii S et al (2021) Current status of the rheumatologists' workforce in Latin America: a PANLAR collaborative study. *Clin Rheumatol* 40:2913–2920. <https://doi.org/10.1007/s10067-020-05555-w>
- Miloslavsky EM, Bolster MB (2020) Addressing the rheumatology workforce shortage: a multifaceted approach. *Semin Arthritis Rheum* 50:791–796. <https://doi.org/10.1016/j.semarthrit.2020.05.009>
- Dejaco C, Lackner A, Buttgeret F et al (2016) Rheumatology workforce planning in western countries: a systematic literature review. *Arthritis Care Res* 68:1874–1882. <https://doi.org/10.1002/acr.22894>
- Widdifield J, Barber CEH, Bernatsky S et al (2021) Evaluation of rheumatology workforce supply changes in Ontario, Canada, from 2000 to 2030. *Healthc Policy* 16:119–135. <https://doi.org/10.12927/HCPOL.2021.26428>
- Harrison MJ, Lee S, Deighton C, Symmons DPM (2011) UK rheumatology consultant workforce provision 2007–9: Results from the BSR/Arthritis Research UK Consultant Workforce Register. *Clinical Medicine. J R Coll Physicians Lond* 11:119–124. <https://doi.org/10.7861/clinmedicine.11-2-119>
- Aggarwal A, Haq SA (2020) Rheumatology workforce issues in South Asia: challenges and solutions. *Int J Rheum Dis* 23:443–447. <https://doi.org/10.1111/1756-185X.13793>
- March L, Smith EUR, Hoy DG et al (2014) Burden of disability due to musculoskeletal (MSK) disorders. *Best Pract Res Clin Rheumatol* 28:353–366. <https://doi.org/10.1016/j.berh.2014.08.002>
- Hoy DG, Smith E, Cross M et al (2014) The global burden of musculoskeletal conditions for 2010: an overview of methods. *Ann Rheum Dis* 73:982–989. <https://doi.org/10.1136/annrheumdis-2013-204344>
- Alzahrani H, Alshehri MA, Alotaibi M et al (2022) Burden of musculoskeletal disorders in the gulf cooperation council countries, 1990–2019: findings from the global burden of disease study 2019. *Front Med*. <https://doi.org/10.3389/fmed.2022.855414>
- Amiri F, Kolahi A-A, Nejadghaderi SA et al (2023) The burden of gout and its attributable risk factors in the middle east and north Africa region, 1990 to 2019. *J Rheumatol* 50:107–116. <https://doi.org/10.3899/jrheum.220425>
- Khursheed T, Sharif M, Khan MS et al (2023) Burnout in South Asian rheumatologists in the COVID-19 pandemic: an online survey. *Rheumatol Int* 43:1143–1150. <https://doi.org/10.1007/s00296-023-05304-7>
- Ali Jadoo SA, Aljunid SM, Dastan I et al (2015) Job satisfaction and turnover intention among Iraqi doctors: a descriptive cross-sectional multicentre study. *Hum Resour Health* 13:21. <https://doi.org/10.1186/s12960-015-0014-6>
- Kabbash I, El-Sallamy R, Zayed H et al (2021) The brain drain: why medical students and young physicians want to leave Egypt. *East Mediterr Health J* 27:1102–1108. <https://doi.org/10.26719/emhj.21.050>
- Chardin J (2004) Arab world. In: Wikipedia. https://en.wikipedia.org/wiki/Arab_world. Accessed 6 Aug 2023
- The World Bank (2021) World Bank country and lending groups. <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>. Accessed 6 Aug 2023
- Worldometer (2023) World demographics. <https://www.worldometers.info/demographics/world-demographics/>. Accessed 24 Jun 2023
- Statista (2023) Empowering people with data. <https://www.statista.com/>. Accessed 24 Jun 2023
- Ziadé N, Hmamouchi I, el Kibbi L et al (2020) The impact of COVID-19 pandemic on rheumatology practice: a cross-sectional multinational study. *Clin Rheumatol* 39:3205–3213. <https://doi.org/10.1007/s10067-020-05428-2>
- Dejaco C, Putrik P, Unger J et al (2018) EULAR “points to consider” for the conduction of workforce requirement studies in rheumatology. *RMD Open*. <https://doi.org/10.1136/rmdop-en-2018-000780>
- Wallace (2023) Claire 29 specialities with the highest, lowest job satisfaction. In: Becker's ACS Review. <https://www.beckersasc.com/asc-news/29-specialities-with-the-highest-lowest-job-satisfaction.html#:~:text=Dermatologists%20have%20the%20highest%20job,2022%20speciality%20report%20from%20Medscape>. Accessed 6 Aug 2023
- Wikipedia (2023) Geography of the Arab world. https://en.wikipedia.org/wiki/Geography_of_the_Arab_world#:~:text=The%20Greater%20Maghreb%2C%20which%20includes,%2C%20Bahrain%2C%20Kuwait%20and%20Yemen. Accessed 6 Aug 2023
- Wikipedia (2023) Levant. <https://en.wikipedia.org/wiki/Levant>. Accessed 6 Aug 2023
- Eysenbach G (2004) Improving the quality of web surveys: the checklist for reporting results of internet E-surveys (CHERRIES). *J Med Internet Res* 6:e34. <https://doi.org/10.2196/jmir.6.3.e34>
- Puchner R, Vavrovsky A, Pieringer H et al (2020) The supply of rheumatology specialist care in real life. Results of a nationwide survey and analysis of supply and needs. *Front Med* 7:16. <https://doi.org/10.3389/fmed.2020.00016>
- Lázaro y De Mercado P, Blasco Bravo AJ, Lázaro y De Mercado I et al (2013) Rheumatology in the community of Madrid: current

- availability of rheumatologists and future needs using a predictive model. *Reumatol Clín (Engl Ed)* 9:353–358. <https://doi.org/10.1016/j.reumae.2013.01.019>
27. Hanly JG (2001) Manpower in Canadian academic rheumatology units: current status and future trends. *Canadian Council of Academic Rheumatologists. J Rheumatol* 28:1944–1951
 28. Ziade N, Hmamouchi I, El Kibbi L (2022) Women in rheumatology in the Arab league of associations for rheumatology countries: a rising workforce. *Front Med* 9:880285. <https://doi.org/10.3389/fmed.2022.880285>
 29. Valenzuela O, Ibáñez Vodnizza SE (2019) How to reduce the waiting time for the first consultation with the rheumatologist as a first step for a timely treatment. *Ann Rheum Dis* 78:279.1–279. <https://doi.org/10.1136/annrheumdis-2018-213793>
 30. Delaurier A, Bernatsky S, Baron M et al (2012) Wait times for rheumatology consultation: is rheumatoid arthritis prioritized? *J Clin Rheumatol* 18:341
 31. Ledingham JM, Snowden N, Rivett A et al (2017) Achievement of NICE quality standards for patients with new presentation of inflammatory arthritis: observations from the National Clinical Audit for Rheumatoid and Early Inflammatory Arthritis. *Rheumatology* 56:223–230. <https://doi.org/10.1093/rheumatology/kew308>
 32. Widdifield J, Bernatsky S, Thorne JC et al (2016) Wait times to rheumatology care for patients with rheumatic diseases: a data linkage study of primary care electronic medical records and administrative data. *Can Med Assoc Open Access J* 4:E205–E212. <https://doi.org/10.9778/cmajo.20150116>
 33. Mousavi SE, Nejadghaderi SA, Khabbazi A et al (2022) The burden of rheumatoid arthritis in the Middle East and North Africa region, 1990–2019. *Sci Rep* 12:19297. <https://doi.org/10.1038/s41598-022-22310-0>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.

Authors and Affiliations

Nelly Ziade^{1,2}  · Ihsane Hmamouchi^{3,4}  · Chafika Haouichat^{5,10}  · Fatemah Baron⁶  · Sulaiman Al Mayouf⁷  · Nizar Abdulateef⁸  · Basel Masri⁹  · Manal El Rakawi¹⁰  · Lina El Kibbi¹¹  · Manal El Mashaleh¹²  · Bassel Elzorkany¹³  · Jamal Al Saleh¹⁴  · Christian Dejaco^{15,16}  · Fatemah Abutiban¹⁷ 

✉ Nelly Ziade
nellziade@yahoo.fr; nelly.zoghbi@usj.edu.lb

Ihsane Hmamouchi
ihsane.hmamouchi@gmail.com

Chafika Haouichat
chaouichat@yahoo.fr

Fatemah Baron
fbaroun@googlemail.com

Sulaiman Al Mayouf
mayouf@kfshrc.edu.sa

Nizar Abdulateef
nazarlateef@yahoo.com

Basel Masri
basel.masri@masriclinic.co

Manal El Rakawi
m.elrakawi@gmail.com

Lina El Kibbi
linakibbe@hotmail.com

Manal El Mashaleh
manal_mashaleh@yahoo.com

Bassel Elzorkany
basselzorkany@gmail.com

Jamal Al Saleh
drjamalalsaleh@hotmail.com

Christian Dejaco
christian.dejaco@gmx.net

Fatemah Abutiban
thething99@hotmail.com

¹ Rheumatology Department, Saint-Joseph University, Beirut, Lebanon

² Tour Des Consultations Externes, Hotel-Dieu de France Hospital, 6th Floor, Alfred Naccache blvd., Achrafieh, Beirut, Lebanon

³ Laboratory of Clinical Research and Epidemiology, Faculty of Medicine, Mohammed V University, Rabat, Morocco

⁴ Department of Medicine, Health Sciences College, International University of Rabat (UIR), Rabat, Morocco

⁵ Rheumatology Department, Djillali Bounaama University Hospital, Douera, Algeria

⁶ Unit of Rheumatology, Internal Medicine Department, Al-Jahra Hospital, Ministry of Health, Kuwait City, State of Kuwait

⁷ Division of Rheumatology, Department of Pediatrics, King Faisal Specialist Hospital and Research Center. College of Medicine, Al Faisal University, Riyadh, Saudi Arabia

⁸ Rheumatology Unit, Department of Medicine, College of Medicine, University of Baghdad, Baghdad, Iraq

⁹ Rheumatology Division, Department of Internal Medicine, Jordan Hospital and Medical Center, Amman, Jordan

¹⁰ Rheumatology Department, Faculty of Medicine El Mahdi Si Ahmed, Blida, Algeria

¹¹ Division of Rheumatology, Department of Internal Medicine, Specialized Medical Center, Riyadh, Saudi Arabia

¹² Rheumatology Division of Internal Medicine, King Hussein Medical Center, Royal Medical Services, Jordan Armed Forces, Amman, Jordan

¹³ Rheumatology Department, Cairo University, Giza, Egypt

¹⁴ Rheumatology Department, Dubai Hospital, Dubai, UAE

¹⁵ Department of Rheumatology and Immunology, Medical University of Graz, Graz, Austria

¹⁶ Department of Rheumatology, Hospital of Bruneck (ASAA-SABES), Brunico, Italy

¹⁷ Unit of Rheumatology, Department of Internal Medicine, Jaber Alahmed Hospital, Ministry of Health, Kuwait City, State of Kuwait