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Period-prevalence and Publication Rate of Health Research Productivity in Seven Arabian Gulf Countries: Bibliometric Analysis from 1996 to 2018

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ABSTRACT

Objectives: Despite the worldwide increase in health research, few studies have evaluated the health research productivity in member states of the Gulf Health Council (GHC). This study solicited the period-prevalence and publication rates of health research productivity in the seven GHC countries. ***Methods:*** We searched the Scopus database for publications between 1996 and 2018 and used the SCImago Journal and Country Rank portal to obtain the relevant information. We also recorded qualitative (citation-based) and quantitative (document recount) indicators. Overall and country-specific period-prevalence and publication rates were estimated and standardized to the corresponding overall Gulf Cooperation Council (GCC) population and country-specific population size. ***Results:*** Overall, 112 409 articles were enumerated during the study period. The majority (59.8%) were from Saudi Arabia, followed by UAE (11.9%). The GCC publications were associated with 1 315 778 citations, which revealed a 46.0 Hirsch-index. The period-prevalence of health publications for the overall GCC region was 1320 publications per million population over 22 years, and the publication rate estimate was 13.2 (95% confidence interval (CI): 13.1–13.3) publication per 10 000 population. The highest publication rate estimate was noted in Qatar (36.5; 95% CI: 35.8–37.3), followed by Kuwait, Bahrain, Saudi Arabia, UAE, Oman, and Yemen. ***Conclusions:*** This study is the first study in the context of GCC to utilize period-prevalence and publication rates to chart health research productivity in the GCC region. Concerted efforts are required to improve the quality and quantity of the health research output in the GCC region.

Advancing health research agenda is becoming a national priority for most developing and industrialized countries of Western Europe and North America and some countries in the Asian-Pacific Rims.[1] Data from the Global Observatory on Health Research and Development indicate Western Europe, North America, Australia, and the so-called 'Asian Tiger' economies (which includes Hong Kong, Singapore, South Korea, and Taiwan), and more recently China are disproportional dominating research compared to emerging economies or societies in transition.[2] Moreover, research and development often hinge on multiple factors, including social and economic variables, the presence of academic institutions and full-time researchers, and political commitment.

The Gulf Cooperation Council (GCC) brings together six Arab countries that have similar socioeconomic characteristics and political outlooks. These are the UAE, Bahrain, Saudi Arabia, Oman, Qatar, and Kuwait. In addition to these six countries, Yemen is also a member of the Gulf Health Council (GHC), which is the executive arm of the Council of Ministers of Health in the GCC region.[3]

Healthcare systems and research institutions in the GCC region have witnessed significant growth over the last five decades, and the GCC has been widely lauded to have adequate healthcare systems.[4] This growth has been accompanied by an increased healthcare burden and the scarcity of available evidence to support proper response to the emerging pattern of disease and changing demography.[5]

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Therefore, it is crucial to generate and disseminate new knowledge and address health issues, their distributions, and root causes.

Despite the known increase in health research productivity worldwide, scant attention has been geared toward the bibliometric analysis of the health research patterns in the GCC region that are equipped to shed light on the period-prevalence and publication rates within the population denominator. Bibliometric studies have been utilized to assess the scientific output of different world regions in several scientific fields.[6] The few that have emerged in the GCC have focused on specific subspecialties, and barely any have focused on period-prevalence within the confound of the nation's population.[7–10] An extensive literature search indicated only one study that has traced the medical research productivity over a prescribed period.[7] Noteworthy, this study did not take account of period-prevalence. With the broader part of the Arab world, bibliometric indicators suggested a general paucity in productivity and reduced visibility compared to other regions.[7,11–15]

Within the aforementioned literature and the entailed implications, this study has embarked to fulfill interrelated objectives: 1) to estimate the cumulative frequency and citation indices of health research publications, and the period-prevalence and publication rate standardized to population size; and 2) to assess the period-prevalence trends over prescribed time intervals of the GCC countries and Yemen. These countries share geographical proximity and cultural heritage, and all are located in the Arabian Peninsula.

METHODS

This cross-sectional descriptive study (bibliometric review) was conducted from January to March 2020 to assess the status and evolving trends of health research publication productivity in the GCC, including the seven member states of the GHC, and to assess the level of visibility in comparison to the international context.

Data were obtained from the free access SCImago Journal & Country Rank (SCJR) portal (SCImago Group 2007). The SCJR is a publicly available portal that amassed all major publishers.[16,17] The portal also allows one to calculate a country's rankings and compare them with others. Journals are divided into 27 main subject areas and 313 specific subject categories. Citation data is calculated from > 34 100 periodic derived > 5000 publishers. The portal is equipped to display biometrics from 239 countries. Data from the SCJR portal was collected independently by two investigators from the research team. The information was reviewed by two senior investigators, and discrepancies were resolved in light of the source at the SCJR portal.

It has been suggested that the SCJR portal has more geographic coverage and breadth and depth of global publishers, including those covering medical sciences.[18] For the present context, accrue data were standardized to the number of publications per million of the population (PPMP) in each country. Data on each country's population was accessed via the World Bank's portal.[19]

The included thematic distribution corresponded to the following five categories: medicine, nursing, health professions, pharmacology, and dentistry. The period chosen was from 1996 to 2018 (22 years). Data were retrieved for the seven members states in the GHC: UAE, Bahrain, Saudi Arabia, Oman, Qatar, Kuwait, and Yemen.

Information was retrieved for the following indicators related to the cumulative frequency of publications and citation indices: total number of health articles published between 1996 and 2018, number of citations, number of self-citations, number of citations per article, and Hirsch-index (H-index), which was used as a measure of impact. H-index was defined as the number of documents of a country with citations.[16]

Period-prevalence and publication rates were calculated as measures of the occurrence of cumulative health publications. Period-prevalence was calculated, as detailed elsewhere,[20] by dividing the number of published articles during the specified period over the mid-year average population size for the overall GCC region and each specific country during that specified period. The period-prevalence was then multiplied by one million and was reported as PPMP. The publication rate was calculated by allotting the number of publications by the population size and then multiplied by 10 000, so it was reported as publication per 10 000 population. The 95% confidence intervals (CIs) of publication rate were calculated using Poisson approximation to the binomial distribution for the prevalence rates.[21] We used Episheet software to calculate CIs.[22] Descriptive data analysis and depiction of graphs

Table 1: Cumulative frequency and citation indices of health research publications in the Gulf Cooperation Council (GCC) countries, 1996 to 2018.

Countries	Articles	Citations	Self-citations	Citations per article	Hirsch index
	n (%)	n (%)	n (%)		
Overall GCC	112 409 (100)	1 315 778 (100)	148 935 (11.3)	11.7	46.0
Saudi Arabia	67 185 (59.8)	736 419 (56.0)	100 176 (13.6)	11.0	86.0
Kuwait	10 092 (9.0)	138 006 (10.5)	11 718 (8.5)	13.7	52.8
UAE	13 358 (11.9)	180 207 (13.7)	13 844 (7.7)	13.5	55.6
Oman	6489 (5.8)	73 193 (5.6)	6602 (9.0)	11.3	34.6
Qatar	10 167 (9.0)	123 255 (9.4)	12 672 (10.3)	12.1	46.0
Bahrain	3203 (2.8)	40 161 (3.1)	2058 (5.1)	12.5	24.4
Yemen	1915 (1.7)	24 537 (1.9)	1865 (7.6)	12.8	22.8

were generated using Microsoft Excel (Microsoft Office 365).

RESULTS

Table 1 shows the cumulative frequency of health research articles published in GCC countries from 1996 to 2018. A total of 112 409 articles were enumerated. The majority (59.8%) were from Saudi Arabia, followed by UAE (11.9%), Qatar (9.0%), Kuwait (9.0%), Oman (5.8%), Bahrain (2.8%), and Yemen (1.7%).

Table 1 also shows the citation indices of health research articles published in GCC countries. Overall, the GCC publications were associated with a total of 1 315 778 citations, of which 11.3% were self-citations. Subsequently, the overall citations per article rate were 11.7, and the H-index was 46.0. Generally, the distribution of the number of citations per country was proportionate to that of the number of articles. The H-index ranged from 86.0 to 22.8. The highest was noted in Saudi Arabia (86.0), followed by UAE (55.6), Kuwait (52.8), Qatar (46.0), Oman (34.6), Bahrain (24.4), and Yemen (22.8).

Table 2 shows the measures of cumulative health publications in the GCC countries from 1996 to 2018. The period-prevalence of health publications for the overall GCC region was 1320 PPMP over the 22 years. This period-prevalence yielded a publication rate estimate of 13.2 (95% CI: 13.1–13.3) PPMP. The highest estimated period-prevalence (measured as PPMP) was observed in Qatar (3655), followed by Kuwait, Bahrain, Saudi Arabia, UAE, Oman, and Yemen. Consequently, the highest publication

Table 2: Measures of cumulative health publications in the Gulf Cooperation Council (GCC) countries, 1996–2018.

Country	Cumulative articles	Population size	Period prevalence[a]	Publication rate[b]
	n (%)	n (%)	PPMP	Rate (95% CI)
Overall GCC	112 409	85 147 501	1320	13.2 (13.1–13.3)
Saudi Arabia	67 185 (59.8)	33 699 947 (39.6)	1994	19.9 (19.8–20.1)
Kuwait	10 092 (9.0)	4 137 309 (4.9)	2439	24.4 (23.9–24.9)
UAE	13 358 (11.9)	9 630 959 (11.3)	1387	13.9 (13.6–14.1)
Oman	6489 (5.8)	4 829 483 (5.7)	1344	13.4 (13.1–13.8)
Qatar	10 167 (9.0)	2 781 677 (3.3)	3655	36.5 (35.8–37.3)
Bahrain	3203 (2.8)	1 569 439 (1.8)	2041	20.4 (19.7–21.1)
Yemen	1915 (1.7)	28 498 687 (33.5)	67	0.7 (0.6–0.7)

[a]*Period prevalence is per million population (PPMP).*

[b]*Publication rate is per 10 0000 population.*

CI: confidence interval.

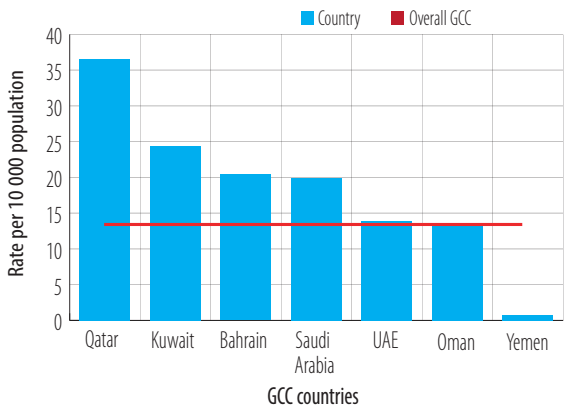

Figure 1: Publication rate estimates (per 10 000 population) for Gulf Cooperation Council (GCC) countries from 1996 to 2018.

rate estimate was noted in Qatar (36.5; 95% CI: 35.8–37.3), followed by Kuwait, Bahrain, Saudi Arabia, UAE, and Oman. The least publication rate estimate was noted in Yemen (0.7; 95% CI: 0.6–0.7). Figure 1 depicts the publication rate estimates for GCC countries to the overall publication rate estimate for the GCC region.

Figure 2 depicts the year-specific period-prevalence trend of health publications for the overall GCC region, measured in PPMP, from 1996 to 2018. Generally, the GCC region witnessed an increasing trend in period-prevalence over the years. The trend plateaued from 1996 to 2002 and then spurted in 2010. From 2011 onwards, the period-prevalence trend continued to accelerate steeply.

Figure 3 depicts the year-specific period-prevalence trend of health publications for individual GCC countries measured in PPMP from 1996 to 2018. Generally, all countries showed an increasing trend in period-prevalence over the years. Nonetheless, the increase in trends across time and countries appears to fluctuate. The most ascending trend was observed in Qatar, Saudi Arabia, and Oman. The least ascending trend was observed in Kuwait and UAE.

Figure 4 depicts the five-year period-prevalence trend of health publications for the GCC region measured in PPMP from 1996 to 2018. Generally, the overall GCC region showed an increasing trend in the five-year period-prevalence over the follow-up period. All countries showed an increasing trend, except Kuwait, where the five-year prevalence indicated a slight decline from 2011 onwards compared to before 2011. The most striking increase is observed in Qatar from 2010 onwards, followed by Saudi Arabia and the UAE. Oman also showed a steady increase from 2010 onwards but with ostensibly lesser vigor compared to Qatar, Saudi Arabia, and the UAE. Bahrain maintained a steady but relatively slow rise over the years. Yemen showed a slow increase over

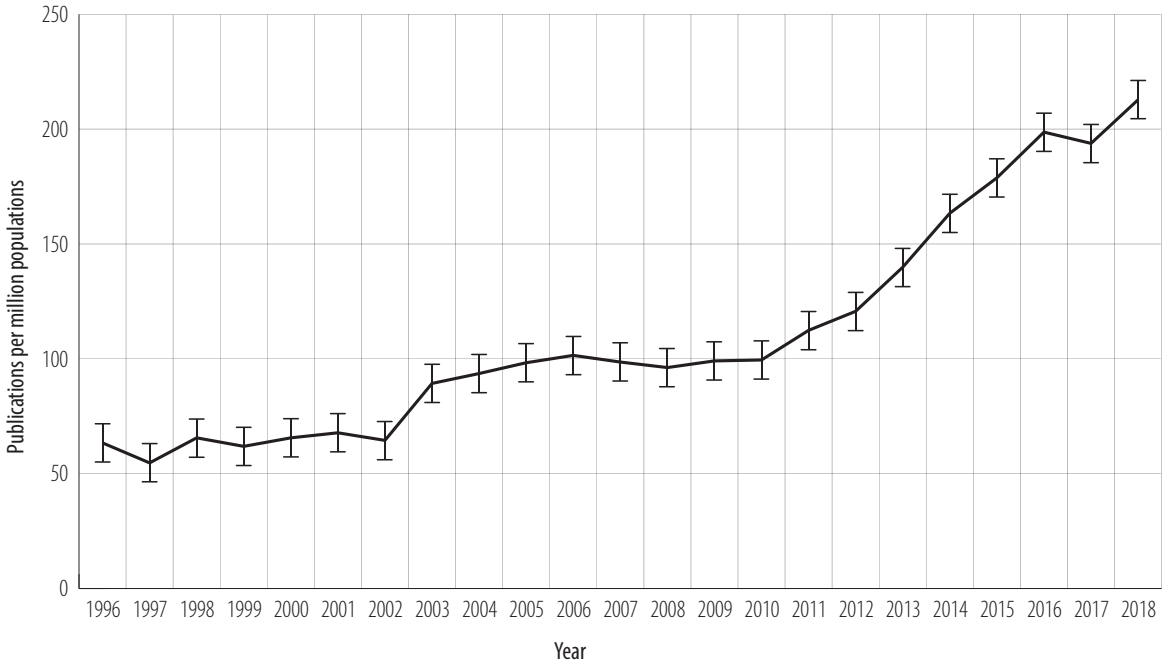

Figure 2: Year-specific period-prevalence trend of health publications in the overall Gulf Cooperation Council region from 1996 to 2018.

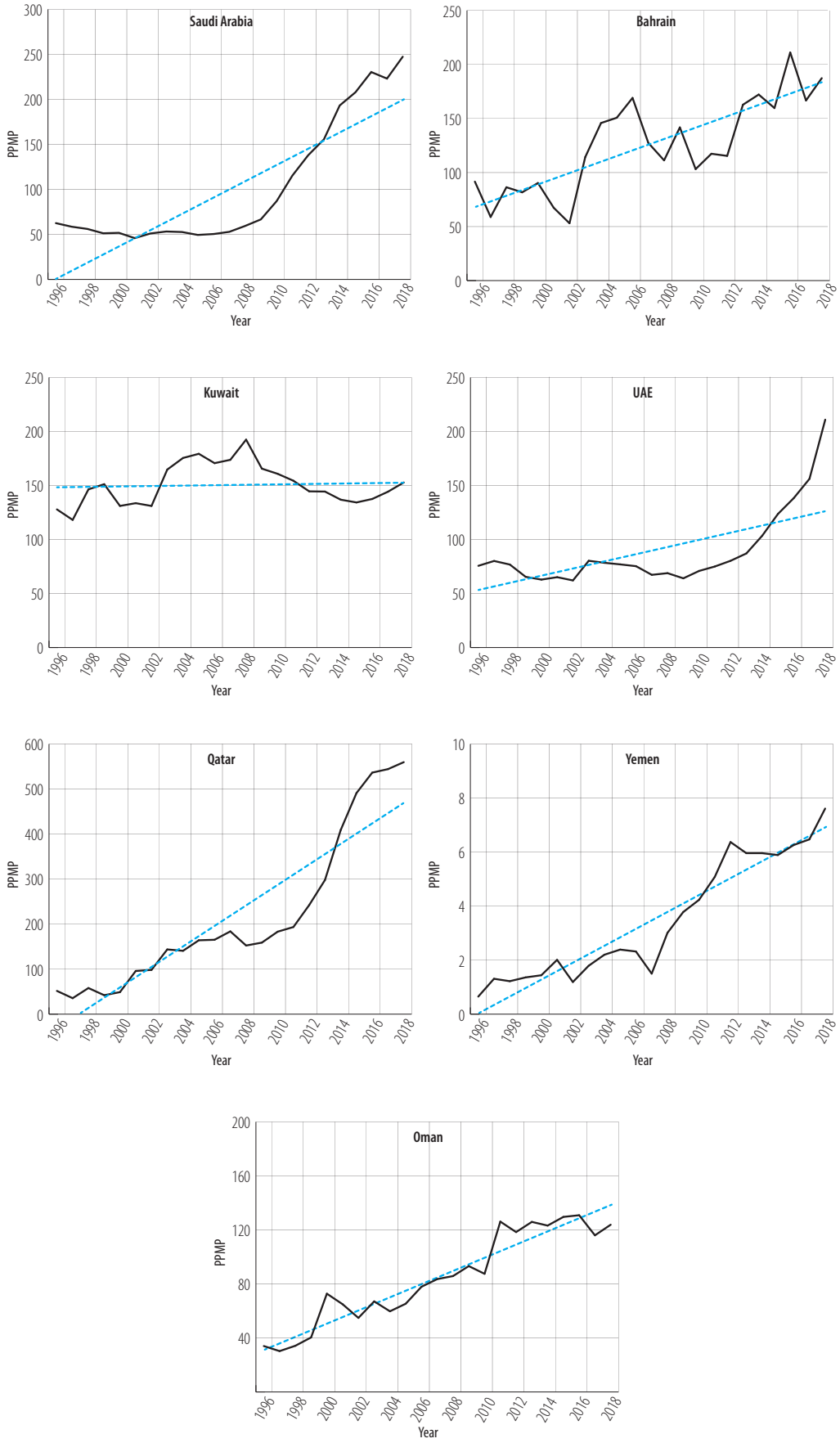

Figure 3: Year-specific period-prevalence trend of health publications (measured in publication per million population (PPMP)) in individual Gulf Cooperation Council countries from 1996 to 2018.

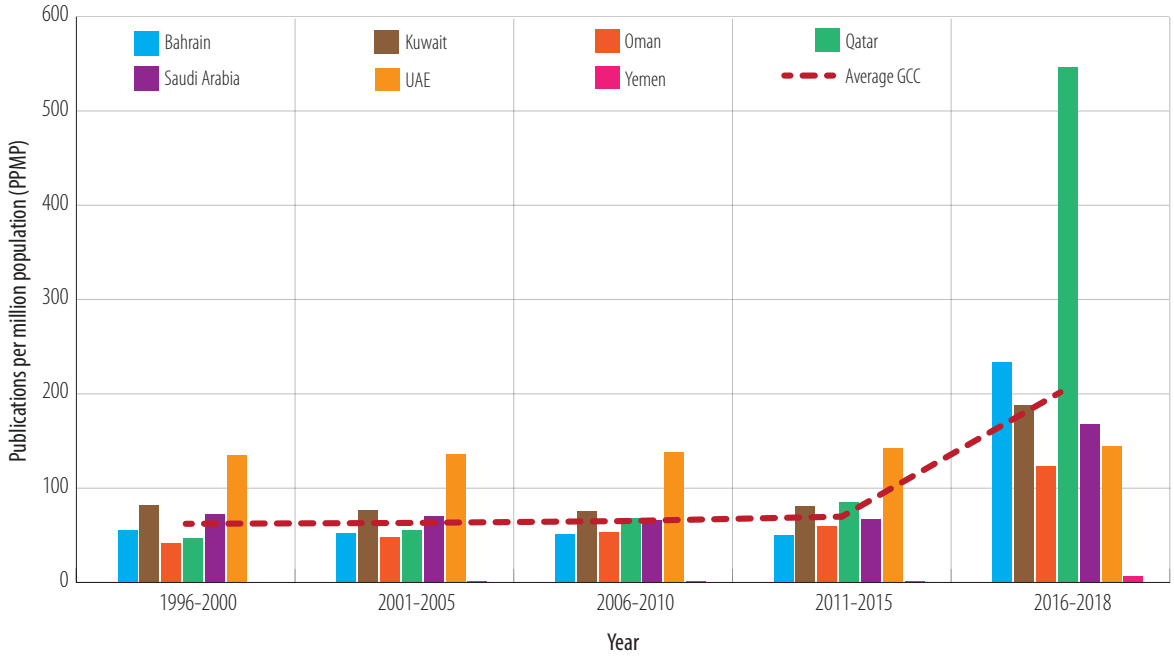

Figure 4: Five-year period-prevalence trend of health publications in the Gulf Cooperation Council (GCC) region.

the years, but it was relative to a lesser magnitude compared to the remaining countries.

DISCUSSION

Through the bibliometric assessment of the SCJR portal, this study analyzed the quality and quantity of health research productivity in seven Arabian GCC countries over 22 years. The study found that the overall period-prevalence was 1320 PPMP. Overall, health research productivity in the GCC has gone through a steady increase during the study period. However, the obtained period-prevalence of health research publications indicated a paucity of health research productivity and reduced impact of the region compared to other regions (e.g., Eastern Mediterranean Region)[7,11–15] and the rest of the world (North America, Western Europe, and Asia-Pacific Rim).[23,24] Several factors may have contributed to the relative paucity of research from the GCC region including inadequate research infrastructure, inadequate funding, and the fact that there is no effort to heighten research capacity building, the significant research data ended up being published in the journals that are not featured in Clarivate Analytics/Web of Science.[25] Without such affiliation, the journals do not accrue the preferred impact factors.[26,27]

Exploration of the cumulative frequency of health research articles in the GCC countries revealed that Saudi Arabia outshined other GCC countries. This view is consistent with the previous report, where Saudi Arabia was applauded to have the highest 'per capita' population progression in publications.[25] In the context of the GCC, Saudi Arabia contributes 59.8% of the research, which is supported by other studies.[7,14] This may stem from the fact that Saudi Arabia has the highest number of health research institutions.[28,29]

The overall H-index for the GCC region was 46.0; the highest was in Saudi Arabia and the lowest in Yemen. The H-index reflects the overall citations per article rate (11.7), and self-citations were 11.3% of the total citations. The H-index embraces the impact of published articles.[30] The H-index has been generally exalted to present the best method to scrutinize research, but there are dissenting views.[16,31] Several reports showed that international collaboration was influential in increasing the citation rate, and therefore the H-index.[32,33] This finding has also corroborated the trend in the Arab countries where international collaboration has increased and, concurrently, the citation rate of research publications increased three-fold.[14] Overall, the presently observed H-index level of the GCC appears to be low compared to industrialized

countries of western Europe, North America, and the Asian Tiger economies.[34]

This study aimed to explore publication rates within a country-specific population size. The overall publication rate was 13.2 per 10 000 population, with the highest in Qatar (36.5). Several reports indicated that Qatar had been the most rapidly developing country in the region.[4] Qatar has embarked on enhancing research and development (R&D), including the advancement of medical sciences.[35] In contrast to its high-income neighbor, Yemen had a low research output and also fared less in many indices of human development.[36]

The trend of period-prevalence of health publications in the GCC region increased over the last 22 years with varying degrees of fluctuation. The most rapid acceleration occurred from 2011 onwards. The country-specific period-prevalence trends showed an increasing trend in each country but with variant speed, with Qatar, Saudi Arabia, and the UAE having the most ascending trends.

The present data suggest that the noted research spurt from 2002 onwards could stem from the increased interest in R&D by GCC countries.[37] The entry of GCC-originated journals onto Scopus and other indexed search engines could have contributed to research in the region becoming more visible and hence accruing impact factors. Despite the recent upsurge of interest in R&D for health research, the number of researchers is relatively low, a situation previously highlighted in the context of Latin America,[24] and many researchers are expatriates who are likely to be more occupied with clincial services and teaching rather than undertaking research. Rahman and Fukui explored the research productivity in 166 countries and suggested that the quality and quantity of research productivity are influenced by various factors and most notable is the gross national product, availability of qualified researchers, public health expenditure, and allocation of resources for R&D.[38] The exploration of these factors to enhance research output in the GCC is therefore warranted.

In the GCC region, the expenditure on R&D appeared to play a pivotal role in health research productivity. Countries with the highest gross domestic product (GDP) per capita, such as Qatar and the UAE, had high research productivity compared to countries with low GDP per capita, such as Yemen. According to Elborai et al,[4] the resources allocated for R&D in the GCC, including capital expenditure, is meager compared to other countries. For example, the UAE and Bahrain barely allocated 0.9% and 0.1% of GDP to R&D, respectively. By contrast, the countries with higher presentations in research output appear to have allocated approximately 2.5% of GDP to R&D.[4] GCC countries would need to heighten their investment in R&D to catch up with the assigned budget of the Organisation for Economic Co-operation and Development countries. Thus, Saudi Arabia would be required to increase its R&D by 1.7% of GDP. Parallel increment would also be desirable in other GCC countries, including 1.6% for UAE, 2% for Qatar, 2.2% for Kuwait, 2.3% for Oman, and 2.4% for Bahrain.[4]

This study suggests each country had an increasing five-year period-prevalence of health publications except in Kuwait, which experienced a windfall from 2011 onwards. Yemen showed a minute increase over the years, but relatively less compared to the remaining GCC countries. Mechanisms are needed to revamp the prevailing research culture in the GCC. In one systematic review for all types of research, the authors suggested the paramount importance of investment in capacity building geared toward individuals, research teams, organizations, and countrywide.[39] Rigorous capacity building needs to be seriously contemplated in the GCC. Additionally, El Rassi et al,[14] suggested that research culture would enormously improve if national-level policies were contemplated, including facilitating tenure, intramural funding programs, and establishing doctoral and postdoctoral programs.

This study is not without limitations. The present data source (SCJR portal) includes publications from a sizeable number of health research journals. However, many articles from the GCC may not necessarily be featured in such an international database. The growth of open access journals testifies such a trend, and some of them are labeled as 'predatory journals'.[40] Similarly, while there is a sizable number of medical journals in the GCC, a significant number are not indexed in either Scopus or Medline.[41] Many journals in the region face difficulty in getting indexed.[14] Despite these caveats relevant to the presently operationalized catchment of all publications, the present analysis is the first to solicit period-prevalence and publication rates from the GCC.

CONCLUSION

This study has embarked on surveying the period-prevalence and publication rates in seven Arabian GCC countries from 1996 to 2018. The GCC publications appear to have an H-index of 46.0, 1320 PPMP, and the publication rate 13.2 per 10 000 population. Although the health research output of the GCC countries appears to have shown exponentially increased over succeeding years, it still falls short in comparison to other countries or regional blocks. Therefore, this study calls for various governmental and non-governmental entities to coordinate efforts to increase health research productivity in the region. Capacity building in all its spheres would be essential to keep the GCC abreast with other countries, and allocation of resources for R&D would be essential if not paramount for the GCC to be part of the global map of R&D.

Disclosure

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