

# Sport and exercise medicine research activity in the Arab world: a 15-year bibliometric analysis

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## ABSTRACT

**Background** The role of sports in decreasing the prevalence of many diseases has led to a growing interest in the field of sport and exercise medicine. But sport and exercise medicine still remains new to the Arab world, waiting to be explored. The aim of this study is to describe and characterise sport and exercise medicine research activity in the Arab world between 2002 and 2016.

**Methods** The PubMed database was used to search for publications related to sport and exercise medicine. Publications were classified according to the country of origin and filtered to include publications between 2002 and 2016. Research output was analysed with respect to gross domestic product (GDP) and population of each country.

**Results** A total of 1148 papers related to sport and exercise medicine were found to be published in the Arab countries between 2002 and 2016. Sport-and-exercise-medicine-related publications constituted 0.86% of the total biomedical research papers published in the Arab world and 0.49% of the world's sport and exercise medicine literature. The number of sport-and-exercise-medicine-related publications per country ranged from zero to 352, with Qatar occupying the top spot. Tunisia ranked first with respect to publications per average GDP, while Qatar ranked first with respect to publications per average population. Comoros, Mauritania, Somalia, Sudan and Yemen were found to have no publications related to sport and exercise medicine.

**Conclusion** Sport and exercise medicine is a novel field in the Arab world. Recognising the barriers facing sport and exercise medicine research and exploring them meticulously remains an essential part of the plan to improve the Arab world's output and contribution in this field.

## INTRODUCTION

Sport and exercise medicine is an ancient honourable medical specialty that dates back to Herodicus, who first used therapeutic exercise for the treatment of disease and maintenance of health. It has played a significant role in many cultures, and was a keystone in the writings and teachings of influential philosophers, like Hippocrates, Galen and Avicenna.<sup>1</sup> Nowadays, physicians and specialists in sport and exercise medicine play an important role in the development of various

## What are the findings?

- ▶ Sport and exercise medicine is a novel field in the Arab world with sports-medicine-related publications constituting 0.86% of the total biomedical research papers published in the Arab world and 0.49% of the world's sports literature.
- ▶ Socioeconomic factors, such as war, poverty and health, force many Arab countries to prioritise in their budget spending and limit investment in research, including sport and exercise medicine research.
- ▶ The rise in sport and exercise medicine research output in the past few years can be attributed to the allocation of greater funds dedicated for academic research, and the involvement of oil-rich Arab countries in international sports events and federations.

## How might it impact on clinical practice in the future?

Enhanced scientific collaborations, expansion in research activities and establishment of Arab medical journals of international calibre would help Arab countries better integrate into clinical research and grow the research culture in sport and exercise medicine.

techniques to promote health and fitness and to ensure the safety and well-being of sportspersons taking part in athletic competitions.<sup>1,2</sup>

Physical inactivity has been identified as the fourth leading risk factor for global mortality, causing an estimated 3.2 million deaths globally.<sup>3</sup> In 2010, WHO estimated that 87% of children and adolescents and 33.2% of adults in the Arab world and the Middle East were insufficiently active.<sup>3</sup> Physical inactivity is associated with an increased risk of cardiovascular diseases, diabetes, colon and breast cancer, hip or vertebral fractures, obesity and depression.<sup>4,5</sup> This increase in physical-inactivity-related diseases has led to an increased interest in sports and physical exercise regionally and internationally.<sup>1</sup> Consequently,



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research interest in sport and exercise medicine has been growing.

The Arab world is made up of 22 countries that are members of the Arab League.<sup>6</sup> The combined population of the Arab countries is close to 300 million.<sup>6</sup> These countries share a common language, and have similar cultural, historical and religious backgrounds. That is why the Arab countries are often regarded as a single unit. In 2016, the Arab world contributed 3.31% to the world gross domestic product (GDP) and made up 5.5% of the world's population.<sup>7</sup>

For the past several decades, Arab countries have lagged behind other nations in biomedical research.<sup>8</sup> The domain of sport and exercise medicine, specifically, is still new in the Arab world, and research topics in this field have yet to be explored. Therefore, the aim of this article is to study the activity and trend of sport and exercise medicine research activity in the Arab world between 2002 and 2016.

## MATERIALS AND METHODS

We used the PubMed database of the National Center for Biotechnology Information to find publications related to the our study. Relevant publications were identified by using the terms "Sport" and "Exercise" in the search field using the Medical Subject Heading function, a controlled comprehensive medical term that provides indexing for articles within MEDLINE in PubMed, separated by the Boolean operator (OR) to avoid overlap.

To classify the publications in accordance with countries of their origin, we used the Boolean operator (AND) followed by the country name and the 'affiliated' function [ad]. For example, to find publications related to sports and exercise medicine in Algeria we entered the phrase "Sport [mesh] OR Exercise [mesh] AND Algeria [ad]". To find all medical publications of any given country we only used the term specific to the location of origin. For example, to identify the medical publications relevant to Egypt, we entered "Egypt [ad]". In the specific case of Lebanon, we altered the search terms to avoid mix up between the Arab country and the many counties named Lebanon in the United States. We used the terms referring to the major Lebanese cities 'Beirut', 'Sidon' and 'Byblos' to identify Lebanese publications.

We included all publications from 2002 to 2016 (inclusive), in order to study the activity of the past 15 years specifically.

We calculated the number of publications per GDP in order to eliminate any bias due to the vast differences in the GDPs of Arab countries. We did so by dividing the number of publications in each country by its average national GDP in billion US\$ between 2002 and 2016. We also calculated the number of publications per country's population to eliminate bias due to varying population sizes. That was done by dividing the number of publications by the average population estimate (1 million individual) of each country between 2002 and 2016.

**Table 1** Ratio of sport and exercise medicine publications to the total biomedical publications in the Arab countries (2002–2016)

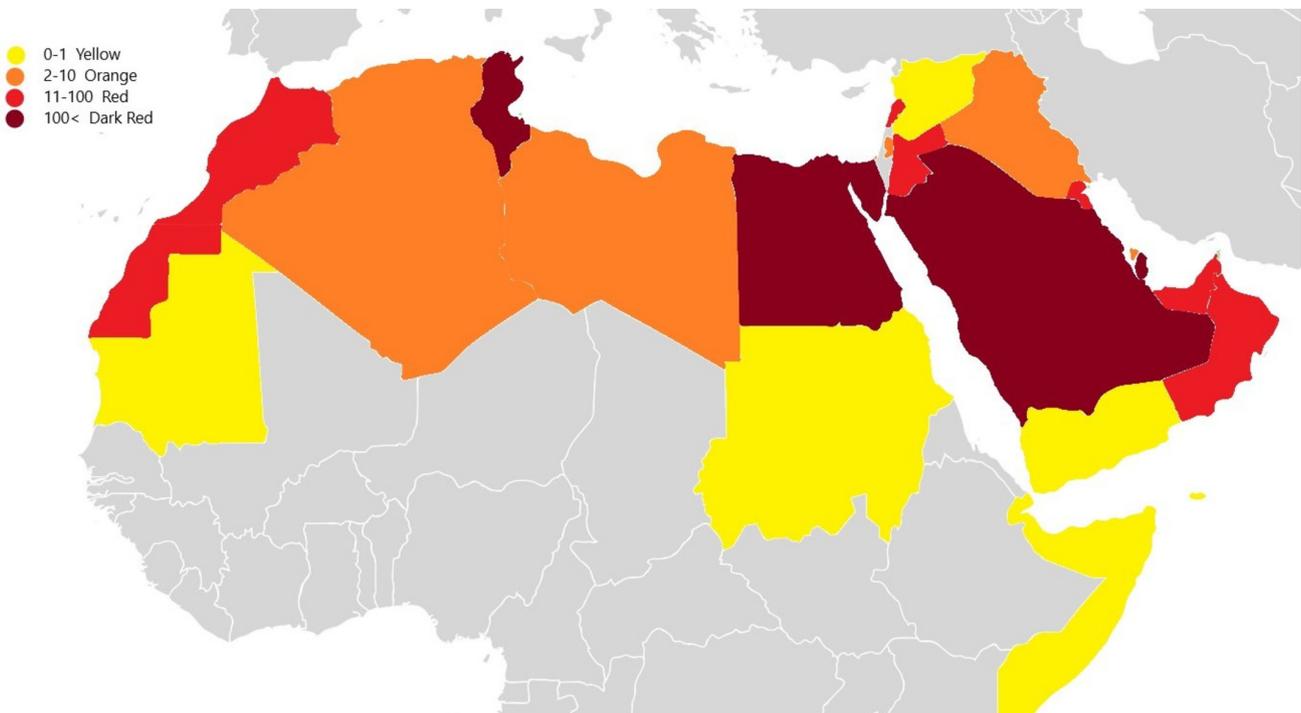
Country	Number of sport and exercise medicine publications	Number of all medical publications	Per cent
Algeria	6	2526	0.24
Bahrain	5	1034	0.48
Comoros	–	17	–
Djibouti	1	72	1.39
Egypt	114	34 722	0.33
Iraq	7	2453	0.29
Jordan	92	7693	1.2
Kuwait	35	4642	0.75
Lebanon	37	13 677	0.27
Libya	3	702	0.43
Mauritania	–	52	–
Morocco	28	5354	0.52
Oman	26	3592	0.72
Palestine (West Bank)	2	953	0.21
Qatar	352	4548	7.74
Saudi Arabia	175	32 903	0.53
Somalia	–	35	–
Sudan	–	2070	–
Syria	1	997	0.1
Tunisia	236	10 665	2.21
UAE	28	4500	0.62
Yemen	–	786	–
Total	1148	133 993	0.86

## RESULTS

In total, 1148 papers related to sport and exercise medicine were published in the Arab world between 2002 and 2016. Sport-and-exercise-medicine-related publications constituted 0.86% of the total biomedical research papers published by the Arab world, and 0.49% of the world's sport and exercise literature in the past 15 years (table 1).

Since 2002, the sport and exercise medicine research output has been on the rise (figure 1). Research activity peaked during the years 2014, 2015 and 2016, during which time collectively 616 research items (~53.6% of the total Arab publications in sport and exercise medicine during the studied period) were published. With respect to output per Arab country, the number of sport-and-exercise-medicine-related publications ranged from zero (Comoros, Mauritania, Somalia, Sudan and Yemen) to 352 (Qatar) (figure 2).

In terms of publications per national GDP, Tunisia ranked first with a ratio of six publications per billion US\$, ahead of Jordan and Qatar who scored ratios of four and three publications per billion US\$, respectively (table 2).

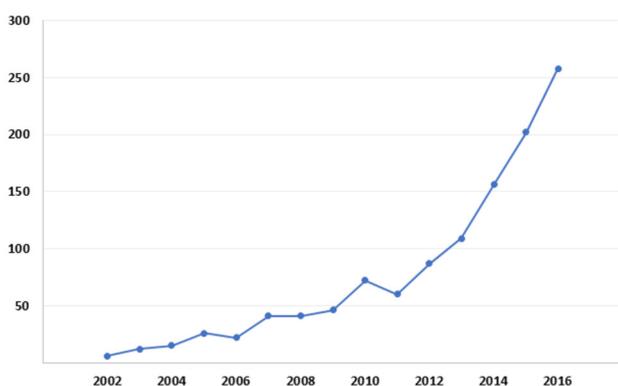


**Figure 1** Distribution of sport and exercise medicine research output in the Arab World (2002–2016).

In terms of publications per population estimate, Qatar ranked first with a ratio of 251 publications per million persons, ahead of Tunisia and Jordan with 22 and 14 publications per million persons, respectively (table 3). Comoros, Mauritania, Somalia, Sudan and Yemen all ranked last with nil sport and exercise medicine publications.

## DISCUSSION

Sport and exercise medicine is a novel field in the Arab world. The 22 Arab countries combined contributed only 0.49% of the world's literature on sport and exercise medicine in the studied time period. Tunisia ranked first with respect to publications per average GDP, while Qatar ranked first with respect to publications per average population. Comoros, Mauritania, Somalia, Sudan and



**Figure 2** The increasing trend of sport and exercise medicine research output in the Arab world between 2002 and 2016.

Yemen all ranked last with no publications related to sport and exercise medicine.

For discussion, we speculate as to why there is little sport and exercise medicine research output in the Arab countries. The lack of research culture and academic medical centres are the main reasons for the shortage of research output.<sup>9 10</sup> Lack of advanced research infrastructure and deficient funding further widen the gap between the Arab world and the Western countries.<sup>11 12</sup> Countries like Yemen, Mauritania, Somalia, Djibouti and Comoros suffer from widespread poverty. In addition, these countries fare poorly with regard to security, health, education and proper nutrition. Therefore, academic research is not prioritised and often sidelined over fulfilling basic needs. However, oil-rich countries, like Saudi Arabia and Qatar, have the ability to allocate more resources for biomedical research, and accordingly, publish more research on sport and exercise medicine than most of the other Arab countries.

Political instability and military conflicts in many of the Arab countries also constitute a major obstacle for them to get active in the clinical research field.<sup>13–20</sup> Wars, internal conflicts and corruption hamper the rise of scientific temper in the Arab countries.<sup>21 22</sup> Studies show that poor governance, exploitation and technological dependency are tightly linked to a higher percentage of illiteracy, marginalised youth and sports sectors and poor scientific performance.<sup>23–25</sup> Moreover, war-ravaged countries suffer greatly from poor research funding, brain drain and fewer research opportunities.<sup>9 26</sup> Wars in Yemen and Palestine, and internal conflicts in Syria, Libya, Sudan, Somalia and Iraq pose barriers to academic

**Table 2** Ratio of sport and exercise medicine publications (2002–2016) to GDP (billion US\$) in each Arab country

Country	Number of sport and exercise medicine publications	Average GDP (in billion US\$)	Sports publications per billion US\$ of GDP
Algeria	6	133.40	0.04
Bahrain	5	23.50	0.21
Comoros	–	0.50	–
Djibouti	1	1.10	0.91
Egypt	114	194.30	0.59
Iraq	7	125.00	0.06
Jordan	92	23.60	3.90
Kuwait	35	113.60	0.31
Lebanon	37	33.20	1.11
Libya	3	50.40	0.06
Mauritania	–	3.70	–
Morocco	28	84.10	0.33
Oman	26	52.40	0.50
Palestine (West Bank)	2	8.20	0.24
Qatar	352	111.60	3.15
Saudi Arabia	175	496.90	0.35
Somalia	–	5.80	–
Sudan	–	54.50	–
Syria	1	37.50	0.03
Tunisia	236	39.30	6.01
UAE	28	271.90	0.10
Yemen	–	26.20	–
Total	1148	1891	0.61

GDP, gross domestic product.

research and performance.<sup>27 28</sup> This would explain why the research outcomes of these countries are poor in this study.

The rise in sport and exercise medicine research output in the past few years can be attributed to the allocation of greater funds dedicated for academic research. Gulf countries like Qatar and Saudi Arabia have only recently started investing in medical research by establishing successful research institutions, allocating large funds for biomedical research activity and attracting international researchers.<sup>10</sup> Moreover, the rise in research output can also be attributed to the involvement of oil-rich countries in international sports events and federations. This includes recent investments by Gulf countries in European sports,<sup>29</sup> the emergence of professional international athletes of Arab descent<sup>30</sup> and the decision made by the FIFA to stage the 2022 FIFA World Cup in Qatar.

## CONCLUSION

Sports medicine is a novel field in the Arab world. Multiple socioeconomic factors lead to decreased research activity and output in sport and exercise medicine. Enhanced

**Table 3** Ratio of sport and exercise medicine publications (2002–2016) to population estimate (per million individual) in the Arab world

Country	Number of sport and exercise medicine publications	Average population (x10 <sup>6</sup> )	Publications per million individual of population
Algeria	6	35.60	0.17
Bahrain	5	1.00	5
Comoros	–	0.70	–
Djibouti	1	0.80	1.25
Egypt	114	79.60	1.43
Iraq	7	30.90	0.23
Jordan	92	6.40	14.38
Kuwait	35	3.00	11.67
Lebanon	37	4.50	8.22
Libya	3	6.10	0.49
Mauritania	–	3.40	–
Morocco	28	32.00	0.88
Oman	26	3.20	8.13
Palestine	2	4.10	0.49
Qatar	352	1.40	251.43
Saudi Arabia	175	27.80	6.29
Somalia	–	9.40	–
Sudan	–	39.30	–
Syria	1	19.90	0.05
Tunisia	236	10.50	22.48
UAE	28	6.30	4.44
Yemen	–	23.10	–
Total	1148	137.70	8.34

scientific collaborations, expansion of research activities and establishment of Arab medical journals of international standard can help Arab countries better integrate into clinical research, and aid in the growth of research culture that has been found to be lacking in the region. Advocating democracy and fighting corruption are both significant contributors to peace and security, which are necessary for research to thrive in the Arab world. Endorsing sports and physical exercise is pivotal in increasing interest in sport and exercise medicine research.

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