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Bibliometric analysis of cardiovascular disease research activity in the Arab world

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Abstract

Background: In the Arab world, the prevalence of chronic non-communicable diseases – such as cancer, diabetes, chronic respiratory conditions, and cardiovascular diseases – has increased. The goal of this article is to assess the activity of research on cardiovascular disease (CVD) by looking at papers that have been published in the Arab world during the past 15 years.

Methods: For this investigation, a search was conducted using EMBASE and Medline (via Ovid and PubMed). Between 2002 and 2016 (inclusive), publications on cardiology and cardiovascular illness were gathered from all 22 Arab nations, categorized by author affiliation.

Results: During the period of our analysis, the Arab world produced only 1% of the total percentage of CVD papers. Nonetheless, there has been a rise in publications in recent years. Qatar and Lebanon had the highest ratio for CVD to non-CVD publications released. Qatar had the highest number of publications per million persons. Tunisia had the highest number of publications per gross domestic products (in US Billion Dollars).

Conclusions: In terms of CVD research activities, the Arab world still lags behind other regions of the world. Five countries are responsible for the majority of publications.

Key words: cardiovascular disease, cardiology, bibliometrics, Arab world, Medline, EMBASE.

Received: 14 February 2024; Accepted: 26 February 2024.

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Introduction

The Arab world is comprised of 22 countries spread over the span of the Middle East and different parts of Africa.¹ As is the case globally, cardiovascular diseases (CVDs) are the leading causes of death in the Arab world. Approximately 17.7 million people died from cardiovascular related incidents in 2015, representing 31% of all global deaths.² Of these deaths, around 7.4 million were due to coronary heart disease and 6.7 million were due to stroke. From 17 million deaths of people under 70 years of age (premature deaths) due to chronic diseases in 2015, 37% are caused by cardiovascular diseases.³

In the Arab world, cardiovascular diseases are increasing at an accelerated rate due to the unhealthy lifestyles people in the Arab countries are leading. Excessive use of tobacco, unhealthy diets, lack of exercise, damaging consumption of alcohol and obesity are the main causes of these cardiovascular diseases.⁴

Of all the Arab countries, the gulf region in general and the children there in specific are the most prone to developing CVDs according to the World Heart Federation.⁵ This is because of the rapid urbanization that has and is still occurring in the Gulf region which is causing packed living conditions for citizens, limitations on green spaces, increased water and air pollution, growing use of tobacco and narcotics and increased consumption of alcohol and fast-food. All of which increase the risk of cardiovascular diseases. Another critical risk factor for developing cardiovascular diseases is malnutrition. Yemen for example is recording the second highest rate of chronic malnutrition among children in the world lagging just behind Afghanistan. Also, 6.8% of children under five years of age are malnourished in Egypt.⁶

The Institute for Health Metrics and Evaluation has showed that the top leading cause of the death in the Arab world is CVDs.⁷ Therefore, research in the Arab world concerning this topic is a top priority. In this article, we will be aiming to ex-

amine the activity of published cardiology and cardiovascular diseases related research in the Arab world. In particular, we will be dissecting the number of publications released on CVDs per country by checking the author location according to institutional affiliation.

Materials and Methods

The PubMed database of the National Center for Biotechnology Information, Ovid and EMBASE databases were used to find the publications related to this study. Publications were identified by searching for the terms *cardiovascular diseases* and *cardiovascular* in the search field using Medical Subject Headings (mesh) in PubMed and similar filters in Ovid and EMBASE.

In PubMed, papers from countries were then identified by using the Boolean operator (AND, OR and NOT) to find and exclude articles related to cardiovascular diseases and country of origin. To do so, we searched for publications with *cardiovascular diseases* as a heading and added the country of affiliation by using the operator “[ad]”. For example, to find publications on cardiovascular diseases in Algeria we inputted “Cardiovascular diseases [mesh] AND Algeria[ad]” into the search box of PubMed. To find all publications from Algeria disregarding cardiovascular disease related ones we used “Algeria[ad] NOT Cardiovascular diseases[mesh]”. Our search was filtered from 2002 to 2016 (inclusive) to find publications

about CVDs specifically and all biomedical research in general from the past 15 years.

A similar process was performed in Ovid and EMBASE to extract publications from the two databases. The publications were imported to EndNote where they were filtered to avoid any occurrence of duplicates.

To find the number of publications per gross domestic product we divided the number of publications by the gross domestic products (GDP) in US Dollars.⁸ To find the ratio of publications per population size, we divided the number of publications by the population size in million persons.⁹

Results

The population estimates and GDP of the 22 Arab countries are shown in Table 1. In the selected year period of our study (2002–2016) 1,032,862 publications on cardiovascular diseases were released on the three databases. Of those, 10,496 publications were from the Arab world comprising only 1%. The ratios of CVD related to non-CVD publications ranged from 0.031 (Algeria) and 0.033 (Palestine/West Bank) to 0.125 (Qatar and Lebanon).

Saudi Arabia ranked first in the number of publications on cardiovascular diseases (Table 1) with 2678, while Somalia and Mauritania ranked last with only 4 and 3 publications respectively (Table 1).

Table 1. Number of publications on cardiovascular disease from 2002 to 2016 (last 15 years) in the Arab World and population estimates and gross domestic product in US Dollars per country.

Country	CVD publications	Non-CVD publications	All biomedical	Ratio	Population (2016)	Average GDP (2016)*
Algeria	186	5900	6086	0.0315	40,263,711	156,079,606,663
Bahrain	153	2323	2476	0.0659	1,378,904	31,858,510,638
Comoros	0	0	0	0	794,678	616,654,490
Djibouti	0	0	0	0	846,687	1,727,000,000(2015)
Egypt	2304	40895	43199	0.0563	94,666,993	336,296,921,758
Iraq	187	3436	3623	0.0544	38,146,025	171,489,001,692
ordan	510	8833	9343	0.0577	8,185,384	38,654,727,746
Kuwait	524	5122	5646	0.1023	2,832,776	114,041,209,704 (2015)
Lebanon	864	6881	7745	0.1256	6,237,738	47,536,798,648
Libya	39	649	688	0.0601	6,541,948 (2015)	29,500,000,000
Mauritania	3	61	64	0.0492	3,677,293	4,634,588,338
Morocco	482	6839	7321	0.0705	33,655,786	101,445,004,812
Oman	367	3732	4099	0.0983	3,355,262	66,293,368,010
Palestine (West Bank)	33	982	1015	0.0336	2,697,687	152,468,681,318
Qatar	584	4654	5238	0.1255	2,258,283	152,468,681,318
Saudi Arabia	2678	36788	39466	0.0728	28,160,273	646,438,380,568
Somalia	4	36	40	0.1111	10,817,354	6,217,000,000
Sudan	84	2425	2509	0.0346	36,729,501	95,584,380,032
Syria	68	926	994	0.0734	17,185,170	42,062,549,395**
Tunisia	961	12420	13381	0.0774	11,134,588	42,062,549,394
United Arab Emirates	362	5574	5936	0.0649	9,267,000	348,743,265,715
Yemen	76	844	920	0.0900	27,392,779	27,317,605,346

CVD, Cardiovascular Disease; GDP, gross domestic product.

*GDP is in current USD. **Numbers from 2011 *i.e.* Beginning of Syrian War of 2011.

The numbers below were retrieved from PubMed, Ovid and EMBASE. Population estimates were retrieved from CIA World Factbook and GDPs were retrieved from World Bank.

To avoid overlap of publications from Lebanon (Arab country found in MENA region) and Lebanon County from Pennsylvania, search terms were refined to *Beirut, Tripoli Lebanon, Saida, Nabatieh and Zahle*.

To avoid another type of bias which would be related to population size, we found the number of publications per million persons. This showed that Qatar (253) and Kuwait (187) ranked first and second, followed by Lebanon with 139 publications per million persons (Figure 1). Somalia with 0.03 ranked last (Figure 1).

As for bias regarding the GDP of each country, that was accounted for by finding the number of cardiovascular disease related publications per GDP (in US Billion Dollars). Tunisia (22)

ranked first, followed by Lebanon 18 publications per billion US Dollars (Figure 2). Somalia ranked last with 0.64 (Figure 3).

Discussion and Limitations

Our results showed that the Arab world only produced 10,496 out of a total of 1,032,862 publications on cardiovascular diseases globally over the past 15 years. This is equivalent to only 1% of the total percentage of CVD related publications released on PubMed, OVID and EMBASE. The trend of the publications released shows an increase in the number of publications over the past 15 years in the Arab world. These

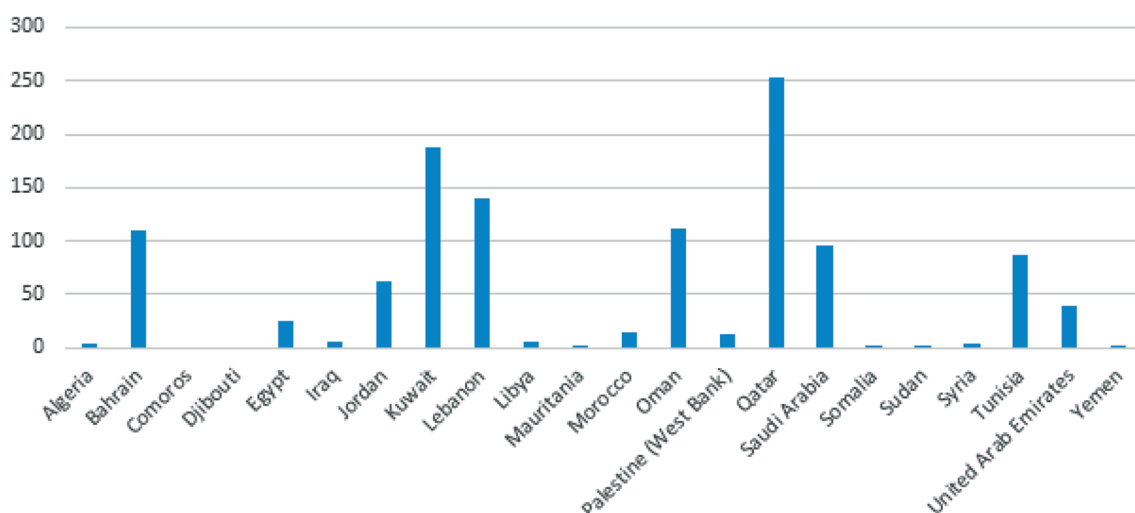


Figure 1. Cardiovascular disease related publications per million persons per country.

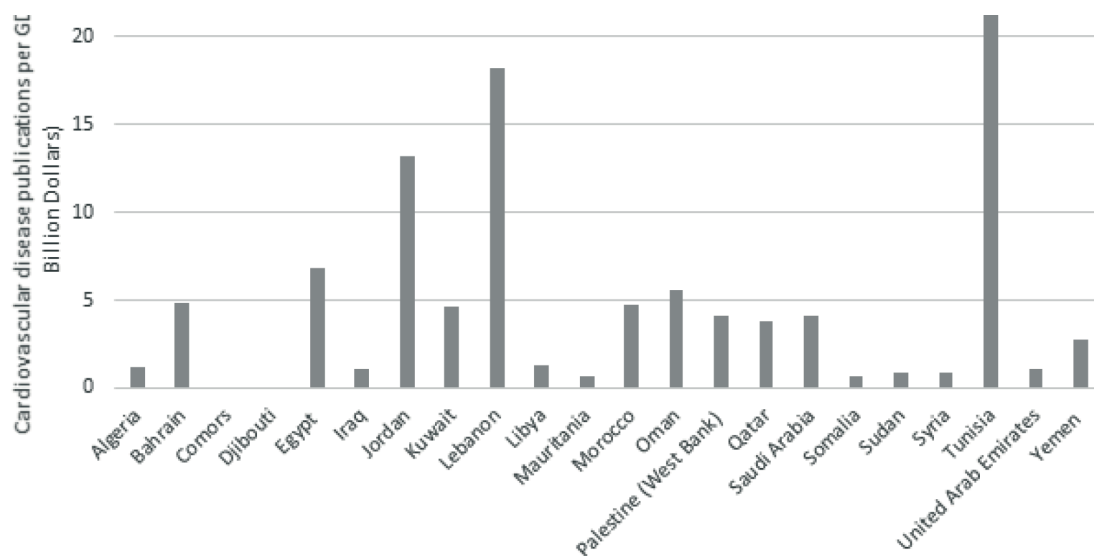


Figure 2. Cardiovascular disease related publications per Average GDP (US Billion Dollars) per country.

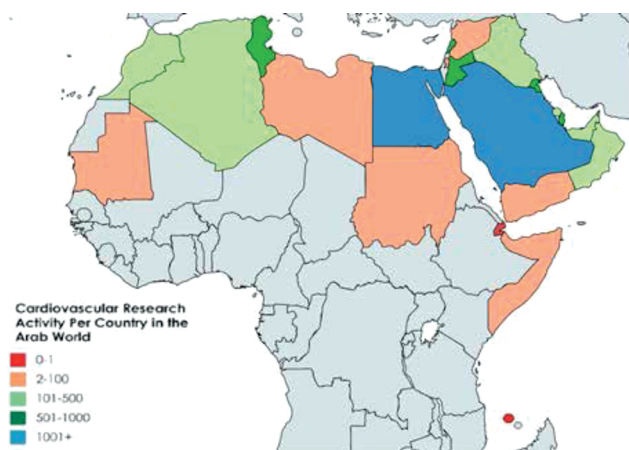


Figure 3. Cardiovascular Research Average Per Country in the Arab World.

results are similar to another study that showed a 36% increase in global CVD publications from 1998 to 2008.¹⁰

Despite these results the Arab world still lags greatly behind other regions of the world. There may be a great number of factors that are causing this underrepresentation of cardiovascular disease publications from Arab countries.

First, we could start off with the orientation of schools and universities in the region to molding physicians into purely clinical professionals with no regard to academia (research). Such orientation from the educational system is decreasing medical students' interest in conducting research, which is decreasing the number of publications compared to the Western world where research is regarded as a priority.¹¹

Another factor would be the lack of funding in most Arab countries. Disregarding countries of the Gulf Cooperation Council, there is an extreme lack of funds present for research and this is causing a huge decline in the research activity of the Arab world.^{12,13}

The lack of proper research facilities is also a problem Arab countries face.¹⁴ To solve this, we would need collaboration between the Arab countries as we have a diversity in resources. Some funding agencies run by wealthy Arab countries could help research facilities to pave way for more research activity in other parts of the Arab world. Another source of this underrepresentation could be bias from some journals towards the publishing of local research publications rather than international ones.

Also, with the great deal of political instabilities present in the Arab world, clinical research faced a great number of obstacles.¹⁵ From political uprisings, such as the Arab Spring earlier in 2011, to the Syrian Civil War in 2011, and events such as those present in Yemen, Bahrain and Palestine, the Arab world is facing a great deal of brain drain from the West as well as a lack of funds because of these political feuds that are occurring, decreasing the amount of funds available for research.¹⁶⁻²⁰

With cardiovascular diseases being the number one cause mortality worldwide, it becomes very clear that further research in

this field must be done. Increased awareness about the number of deaths and different types of complications occurring because of cardiovascular diseases would cause a greater allocation of funds dedicated for academic research concerning cardiovascular disease.

It is still extremely encouraging and impressive to see that in light of all these reasons mentioned above, there is still a growth in cardiovascular disease research in the Arab World.

There are some limitations in our study. First, although we made use of three of the biggest medical databases (PubMed, Ovid, EMBASE) there still might be publications that were not in our scope. Second, we were dependent on the indexing operators of the databases used, as is the case in any other bibliometric study. Third, since we could not pinpoint the real geographical location of the corresponding author, we were limited with the institutional affiliation ([ad] function on PubMed or author affiliation filter on Ovid and EMBASE) to find the publications from each country. Fourth, in our search we only used the terms *cardiovascular disease* and *cardiovascular*, maybe more results could have appeared if we had used the search items *heart disease*, *coronary artery disease*, *myocardial infarction*, *cardiac death*, *valve disease* for example.

The final limitation we faced is that all the publications we gathered were in the English language. A great deal of publications from the Arab world are released in French and Arabic, especially in the Middle East and Northern African region. This could have caused an underestimation of the number of publications released by each country and consequently the total number of CVD publications from the Arab world.

Conclusions

This is the first bibliometric analysis of Arab research activity on cardiovascular disease. Even if the number of publications on CVD has increased recently, Arab nations continue to lag far behind in CVD research when it comes to the West and other parts of the world. Given that CVDs account for the majority of deaths worldwide and in the Arab world in particular, more study is likely to be conducted in the future. Five out of twenty-two Arab countries are mostly responsible for the majority of publications in the Arab world. These countries are Egypt, Lebanon, Qatar, Saudi Arabia, and Tunisia. It is expected that research activity in the Arab world would rise and produce more high-quality publications as a result of the increased funding for research, particularly in the Gulf region, and the shift in focus towards clinical research. Specifically, the Gulf will see noteworthy research productivity in the years to come.

Contributions

The authors contributed equally.

Conflict of interest

The authors declare no potential conflict of interest.

Funding

None.

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