

The Diabetic Foot Research in Arabs' Countries

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Received April 28, 2013; revised May 28, 2013; accepted June 28, 2013

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ABSTRACT

Objective: To review all the studies on diabetic foot disorders (DFDs) that were published on the PubMed[®] site aiming to identify the contributions of the different Arabs' countries in the world scientific literature on this topic. Methods: The PubMed[®] site was searched using different key words for searching all the abstracts on Diabetes mellitus (DM) and DFDs published from Arabs' League countries (n = 22). For this review, the 22 countries were classified into 3 groups: Group 1 (G1): Gulf Council Countries (GCC) countries (n = 6), Group 2 (G2): African Arabs' countries (n = 10), Group 3 (G3): Asian and/or Eastern Mediterranean Arabs' countries (n = 6). All the abstracts on DM coming from all of the 22 Arabs' countries were initially reviewed to locate the ones related to DFDs' management. All of the articles related to DFDs were reviewed by the senior author. A publication index was created to allow a comparison between the productivity of various countries and correlate that to the population number. Results: By April 2012, a total of 906 articles were published on DM, out of them 115 (11.6%) were related to DFDs. The largest number of DM/DFDs research came from G1 countries (n = 437/51) followed by G2 (n = 307/38) and finally G3 (n = 162/26). The percentages of the studies related to DFDs were therefore: 11.6%, 12.3% and 20.6% respectively. Saudi Arabia was the top on the list of all studied countries with 31 studies related to DFDs out of the 187 on DM (16.5%). Conclusion: More research on DFDs is needed in most of the Arabs' countries particularly those in the GCC region which reported very high prevalence rates and are expected to hold these rates for the coming decades. Also, special attention is needed for those lowincome Arabs' countries that had no contributions in DFDs' research.

Keywords: Diabetes Mellitus; Diabetic; Foot; Disorders; Arabs

1. Introduction

The term Arabs' countries or Arabs' World usually refers to The Arab League countries which is composed of 22 countries that stretch on two continents (Asia and Africa) on a large geographical area from the Gulf States and Iraq on the eastern side to Morocco and Mauritania on the western side with a total population of approximately 358 million [1]. These countries share common cultural, social, life style backgrounds and speak one language [1]. However, there are few discrepancies between these countries including differences in the economic, political, health systems and the non-communicable diseases prevalence rates [2]. With regard to the non-communicable diseases, most of the Arabs' countries report high rates of type 2 Diabetes mellitus (DM) with a whole range of (21.1% - 4%), with the highest rates reported in Kuwait and adjacent Gulf Council Countries (GCC) and the lowest in Somalia [2].

According to the International Diabetes Federation (IDF) statistics of 2011, Six Arabs' countries are on the list of the top ten countries that reported highest prevalence rates of DM among 20 - 79-year-old adults globally [3]. These countries in descending order are: Kuwait (21.1%), Lebanon (20.2%), Qatar 20.2%, Saudi Arabia SA 20.0%, Bahrain (19.9%) and the United Arab Emirates UAE (19.2%). These countries are expected to hold their positions on the list of top ten over the coming two decades [4]. In addition, Egypt is the only Arab country on the list of the top ten countries that have the largest number of diabetic patients as it occupies the ninth position on the list with a total number of 7.3 million diabetics in 2011 and that number is expected to increase to reach 12.4 million by year 2030 [3].

Foot disorders are one of the most feared chronic complications of DM [5]. The term diabetic foot disorder DFDs refers to a group of disorders which clinically present with one or more of the following clinical manifestations: foot ulceration, infection, neuropathy, deformity,

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gangrene and/or ischemia [6]. Some of these presentations may overlap in the same patient and frequently on both feet. The reported annual incidence of diabetic foot ulceration varies between 2.1% to 7.4% [7] and the lifetime risk of developing a diabetic foot ulcer has been estimated to be as high as 25% [8]. If not timely and properly managed, the ultimate endpoint of diabetic foot ulcer is amputation in 15% - 27% [7,8]. Furthermore, amputation is usually associated with significant morbidity [7] mortality [9], in addition to social, psychological and financial consequences [7,8,10].

Despite of the high prevalence rates of DM and the predicted associated serious complications of DFDs, the published scientific research from the 22 Arabs' countries was not properly reviewed with regard to the volume and/or quality of the publications compared to similar research from other parts of the world. For this reason, all the abstracts on various aspects of diabetic foot disorders (DFDs) management that have been published on the PubMed[®] [11] site will be reviewed aiming to identify the scientific contributions of the different Arabs' countries in the world literature.

2. Methods

For this review, the electronic database of PubMed[®] site, MEDLINE[®] was extensively searched for all the studies on DM and DFDs (from 1996 to April 2012). The search strategy was developed from clinical medical subjects' headings (MeSH) and using different text words. Search strings were used alone or in combinations. The searches included the following words and terms: "diabetes", "diabetes mellitus", "diabetic", "diabetic foot", "diabetic foot disorders", "diabetic foot ulcer", "diabetic foot ulcreation", "Arab", "Arabs", "Arabs countries" and the name of each of the 22 Arabs' states. Six final year medical students of Faculty of Medicine, king Abdulaziz University conducted the primary research under the supervision of their mentor (HA). For this review, the Arabs' League countries (n = 22) were classified into 3 groups: Group 1 (G1): Gulf Council Countries GCC countries (n = 6), Group 2 (G2): African Arabs' countries (n = 10), Group 3 (G3): Asian and/or Eastern Mediterranean Arabs' countries (n = 6). All of the abstracts of the studies on DM coming from all of the Arabs' countries were reviewed to identify those related to DFDs' management. Subsequently, the articles related to DFDs were reviewed by the senior author and a careful review was conducted to find out the total number of studies in each country on DM and on DFDs and that was compared to similar numbers globally. This was followed by finding out the total number of studies in each of the 22 countries. An index for publications on DM per million of the population was created by dividing the total number of publications on DM alone on PubMed[®] site by the total number of population of each country in million, and a similar index was created for DFDs' research (Tables 1-5). This index was used to limit the bias that may occur on using the total crude number of studies for comparasons between the various regions and countries in view of the wide range in population numbers in Arabs' countries (83.7 - 0.7 million).

3. Results

By April 2012, a total of 906 studies were published on the PubMed[®] site on DM; out of them 115 (11.6%) were related to DFDs (**Table 1**). The publication index per million for the studies published on DM was almost 20 times less than the global rate (45.49 globally vs 2.53 in Arabs' countries) whereas the index was clearly better in studies on DFDs (1.23 vs 0.32 respectively) (**Table 1**).

The largest number of DM/DFDs research came from G1 countries (n = 437/51) [5,6,10,12-59] followed by G2

Fable 1. Contributions o	f all Arabs'	countries to w	vorld literature on	PubMed site.

Description	Approximate population in million	Total number of publications on DM	Index of publications on DM per million	Total number of publications on DFDs	Index of publications on DFDs per million
Globally	7000	318,482	45.49	8612	1.23
Arabs	358.1	906	2.53	115	0.32

DFDs: Diabetic Foot Disorders; DM: Diabetes mellitus.

Table 2.	Contributions of the three groups of Arabs ³	' countries to world literature	as published in P	PubMed site (in	descending
order).					

Group	Approximate population in million	Total number of publications on DM	Index of publications on DM per million	Total number of publications on DFDs	Index of publications on DFDs per million
GROUP 1	40.8	437	10.71	51	1.25
GROUP 2	218.9	307	1.40	38	0.17
GROUP 3	98.4	162	1.64	26	0.26

DFDs: Diabetic Foot Disorders; DM: Diabetes mellitus.

Country	Approximate population in million	Total number of publications on DM	Index of publications on DM per million	Total number of publications on DFDs	Index of publications on DFDs per million
Saudi Arabia	26.5	187	7.05	31	1.16
Kuwait	2.6	102	39.23	17	6.53
United Arab Emirates	5.3	83	15.66	2	0.37
Oman	3.1	43	13.87	0	0.00
Bahrain	1.2	17	14.16	1	0.83
Qatar	2.0	5	2.50	0	0.00

Table 3. Contributions of each country in group 1 countries to world literature as published in PubMed site (in descending order).

DFDs: Diabetic Foot Disorders; DM: Diabetes mellitus.

Table 4. Contributions of each country in group 2 countries to world literature as published in PubMed site (in descending order).

Country	Approximate population in million	Total number of publications on DM	Index of publications on DM per million	Total number of publications on DFDs	Index of publications on DFDs per million
Egypt	83.7	117	1.39	24	0.28
Tunisia	10.7	69	6.44	0	0.00
Sudan	34.2	52	1.52	7	0.20
Morocco	32.3	24	0.74	2	0.06
Libya	5.6	24	4.28	2	0.35
Algeria	37.4	15	0.40	3	0.08
Mauritania	3.4	4	1.17	0	0.00
Somalia	10.0	1	0.10	0	0.00
Djibouti	0.8	0	0.00	0	0.00
Comoros	0.7	1	1.42	0	0.00

DFDs: Diabetic Foot Disorders; DM: Diabetes mellitus.

Table 5. Contributions of each country in group 3 countries to world literature as published in PubMed site (in descending order).

Country	Approximate population in million	Total number of publications on DM	Index of publications on DM per million	Total number of publications on DFDs	Index of publications on DFDs per million
Lebanon	4.1	64	15.60	13	3.17
Jordan	6.5	57	8.76	9	1.38
Palestine	9.3	27	2.90	0	0.00
Iraq	31.1	18	0.57	4	0.12
Yemen	24.8	10	0.40	0	0.00
Syria	22.5	4	0.17	0	0.00

DFDs: Diabetic Foot Disorders; DM: Diabetes mellitus.

(n = 307/38) [60-97] and finally G3 (n = 162/26) [98-123]. The percentages of the studies related to DFDs were therefore: 11.6%, 12.3% and 20.6% respectively. The G1 was ahead of the other 2 groups in the total number of publications and had also better publication index per million both in research conducted on DM and

DFDs (10.7 and 1.2 respectively) (Table 2).

The contributions of various G1 countries in the literature indicated that Saudi Arabia was top on the list of all studied countries with 31 studies related to DFDs out of the 187 on DM (16.5%) followed by Kuwait. However, the Kuwait's index of publications per million was clearly the highest among this group both in research conducted on DM and DFDs. However, two of the G1 countries did not report any study on DFDs on PubMed namely Oman and Qatar (**Table 3**).

In G2 countries, the contributions of various G2 countries indicated that Egypt was on top of the list of G2 with 24 studies related to DFDs out of the 117 on DM (20.5%) followed by Tunisia. However, the Libya's index of publications per million was higher than both Egypt and Tunisia in the research conducted DFDs, whereas Tunisia's index was the best in DM research (**Table 4**). Four countries in this African group did not report any study on DFDs (**Table 4**).

Finally, the contributions of various G3 countries in the literature indicated that Lebanon was on top of the list of all countries in G3 with 13 studies related to DFDs out of the 64 on DM (20.5%) followed by Jordan. The Lebanon's index of publications per million was also the highest among this group in both in research conducted on DM and DFDs. Three countries in G3 did not report any study on DFDs, **Table 5**.

On reviewing the designs of the studies, we did not find any randomized controlled trials. Only one was a systematic review from Kuwait by Matowe *et al.* in 2004 [48]. However, there were a total of 10 prospective cohort studies and 13 case-control studies. The remaining of the published studies were cross-sectional, retrospective, reviews, case reports and letters.

4. Discussion

This review shows that in spite of the high prevalence rates of DM and associated complications in Arabs' countries, the rates of published scientific research in one of the most popular research sites namely PubMed[®], are far lower than similar global rates both in quantity and quality. The United Nations Resolution 61/225, that has been already adopted unanimously in 2006, recognized diabetes as a serious and costly disease that poses a threat to individual well-being and economic progress, especially in low- and middle-income countries [124]. It also addressed the problems of data accuracy in less-developed countries and absence of transparency and national well-designed community studies [124]. Scientific research is therefore crucial to overcome these problems in all countries and particularly those countries that witness high prevalence rates such as many Arabs' countries. The current data clearly demonstrate the timely need for encouraging researchers in all Arabs' countries to have wider contribution in the world literature both in quantity and quality. The Arabs' contribution in DM's research as displayed on PubMed[®] is less by 20 times compared to the global rate. In contrast, their contributions in DFDs' research are relatively better, but still 3 times less than

the global rate. However, the quality of research is not optimum as only one study is a systematic review [48], approximately one third of the studies gives level 3 evidence and the remaining gives level 4 evidence.

When it comes to the inter-regional differences between Arabs' countries in DFDs' research by total numbers of studies, The G1 countries (n = 6) are ahead of the other Arabs' countries (n = 16). Saudi Arabia is on the top of Arabs' countries in the total number of studies on DFDs (n = 31), followed by Egypt (n = 24) and Kuwait (n = 17). However, it seems that Kuwait is ahead of SA if the populations' numbers were taken in consideration as it reported the highest publication's index—as defined here—in all of the Arabs' countries. In G2 countries Egypt is on the top in total number, whereas Libya has relatively better publication's index. In G3, Lebanon occupies the first place on the list of contributions in DFDs' followed by Jordan.

There were total of 10 out of the 22 countries that did not have a single publication displayed on PubMed[®] site; Oman and Qatar in G1; Tunisia, Mauritania, Somalia, Djibouti and Comoros in G2; Syria, Yemen and Palestine in G3. The lack of contribution in the low-income countries may be justified but this observation is difficult to be understood in an oil producing country such as Qatar.

There are several limitations of the current review that make it a rather pilot initial thematic review than a well designed comprehensive systematic review. Limitations also include limiting our search to one database namely PubMed[®], some difficulties encountered in securing the original full articles of all the abstracts and the possibility of missing some of the studies published in French speaking North African countries such as Tunisia. These limitations should be taken in consideration in future similar reviews. Nonetheless, we believe that the current review serves its purpose of initial probing of the Arabs' contributions in DFDs' research. It may be considered as the first step in having more comprehensive future reviews in all and each of the 22 Arabs' countries.

5. Conclusion

More research on DFDs is needed in most of the Arabs' countries particularly those in the GCC region which reported very high prevalence rates and are expected to hold these rates in the coming few decades. Also, special attention is needed for those low-income Arabs' countries that had no contributions in DFDs' research. Improvements should focus not only on quantity but also focus on the quality of the studies.

6. Acknowledgements

The author would like to thank Sheikh "Mohammad Hussein Al-Amoudi Chair for Diabetic Foot Research" at

King Abdulaziz University for supporting of this study.

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