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REVIEW

Diabetes epidemic sweeping the Arab world

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Abstract

The prevalence of type-2 diabetes mellitus (T2DM) has increased dramatically during the last 2 decades, a fact driven by the increased prevalence of obesity, the primary risk factor for T2DM. The figures for diabetes in the Arab world are particularly startling as the number of people with diabetes is projected to increase by 96.2% by 2035. Genetic risk factors may play a crucial role in this uncontrolled raise in the prevalence of T2DM in the Middle Eastern region. However, factors such as obesity, rapid urbanization and lack of exercise are other key determinants of this rapid increase in the rate of T2DM in the Arab world. The unavailability of an effective program to defeat T2DM has serious consequences on the increasing rise of this disease, where available data indicates an unusually high prevalence of T2DM in Arabian children less than 18 years old. Living with T2DM is problematic as well, since T2DM has become the 5th leading cause of disability, which was ranked 10th as recently as 1990. Giving the current status of T2DM in the Arab world, a collaborative international effort is needed for fighting further spread of this disease.

Key words: Diabetes; Arab world; Epidemiology; Etiology; Risk factors and complication

Core tip: The Middle Eastern and North African region has the second highest rate of increases in diabetes anywhere in the world. We comprehensively review type-2 diabetes mellitus (T2DM) in adults and children from 22 Arab speaking countries by reviewing data published from 1980 to 2015; this allowed us to have a better view of the trends in the dramatic increases of T2DM impacting the Arabic region. We also discuss the etiology of this uncontrolled medical crisis and the most commonly reported complications in these Arab speaking countries. Finally, we highlight a number of crucial data that appear to be unavailable but which may be essential for a more comprehensive understanding of the diabetes epidemic sweeping the Arabian region.

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INTRODUCTION

Diabetes mellitus (DM) affects more than 382 million people around the world, of whom 90% are diagnosed with type-2 DM (T2DM)[1]. The prevalence of T2DM has increased dramatically during the last 2 decades[1]. The Arab world is not immune from this epidemic in the prevalence of T2DM. In fact, the Middle Eastern and North African region has the second highest rate of increase in diabetes globally, with the number of people with diabetes is projected to increase by 96.2% in 2035[1]. Having T2DM increases the burden for both patients and their caregivers, and of particular concern for Arab governments is the large economic burden of diabetes in terms of cost of treatment, management of complications, disability and loss of productivity[2-4]. The factors associated with T2DM seem more pronounced in the Arab world. Although genetic risk factors can't be ruled out in the context of T2DM in the Arab world, factors such as obesity, rapid urbanization and lack of exercise are key determinants of the rapid increase of the rate of T2DM among the Arab world[5].

The unavailability of an effective program to contain the dramatic rise in T2DM in the Arab world has led to a serious development in the disease's course, where current data indicates that T2DM can't be ruled out in children less than 18 years old. Children diagnosed with T2DM come from all countries in the Arab world and obesity is a hallmark feature in this age group[6,7].

This review will initially address the epidemiology of T2DM in the Arab world, followed by the etiology of the disease, complication and risk factors of T2DM, and finally will discuss some suggestions related to research on T2DM in the Arab world.

RESEARCH METHODS

We undertook a search of the medical literature using the PubMed, EMBASE and Ovid databases for articles published in English language between 1980 and 2015, and included the following keywords: Diabetes, Arab world, epidemiology, etiology, risk factors and complication, or their corresponding MeSH term synonyms. Among 22 Arabic countries, a total of 2347 papers were identified and screened by title and/or abstract (Figure 1). To ensure that we included the highest number of epidemiological studies from each country, we did not set any limitations on the study design in our exclusion criteria. However, animal or genetic studies, studies not relevant to T2DM, studies on the effects of treatment, and non-primary data such as review articles or adherence studies were excluded (Figure 2). A total of 85 studies were added in the article and were reviewed in full. Among these, 3 studies were concerning Arab immigrants in different countries not listed in Figure 1, and 1 study (not PubMed indexed) was obtained from the references of other paper.

EPIDEMIOLOGY

Adults

Based on the International Diabetes Federation (IDF) estimates from 2013[1], three countries from the Arabic world are among the top 10 countries worldwide for the prevalence of T2DM; these countries are Saudi Arabia, Kuwait and Qatar. The data obtained from each country in the Arabic world reports variation regarding prevalence of T2DM. However, differences in reported prevalence of T2DM within each country can be attributed to the study design, population and diagnostic methods used to obtain these data. The data clearly confirms that the prevalence of T2DM has increased dramatically during the past two decades. For example, studies from Saudi Arabia in the 80's indicated that prevalence of T2DM was between 2.4%-4.3%[8,9], while recent a study in Saudi Arabia indicated a dramatic increase in the rate of T2DM with an estimated prevalence of 25.4%[10]. This pattern of massive increases in the rate of T2DM is similar for Iraq, Oman and other countries within the Arabic world (Table 1).

Children and adolescents

Due to the recent recognition of T2DM during childhood, limited data are available worldwide. This unusual age-related disease has become a focus of attention for medical organizations around the world. A recent analysis showed a significant increase of 30.5% in the prevalence of T2DM among children and adolescents aged 10-19 years old in United States from 2001 to 2009[11]. The international society for pediatric and adolescents diabetes has published comprehensive guidelines for screening, diagnosis and treatment of T2DM in children and adolescents[12].

Not surprisingly, data from the Arab world show similar figures for childhood T2DM. Perhaps more worrying is that recent data from Saudi Arabia reports an age-specific prevalence of 1 per 1000 for T2DM in children less than 18 years old[7], which was similar to the highest prevalence found in specific groups (American Indian and African American) in United States[12]. Additional findings on childhood T2DM are summarized in Table 2.

RISK FACTORS

A number of risk factors could account for the uncontrolled rise in T2DM in the Arab world, with genetic factors likely to play an important role. However, a number of modifiable risk factors such as obesity, rapid urbanization and its associated changes in dietary habits and lack of physical activity are also important determinants in the etiology of T2DM. Other considerations such as multiple pregnancies and a lack of health education may be unique challenges in the diabetes epidemic in the Arab world.

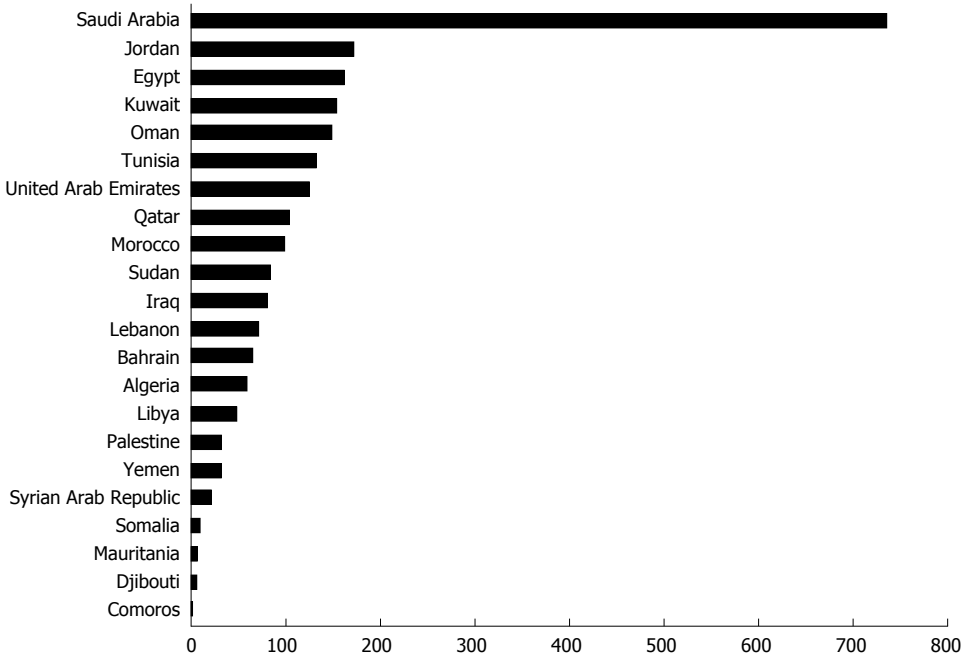

Figure 1 Number of studies reviewed by title and/or abstract for each Arabic country.

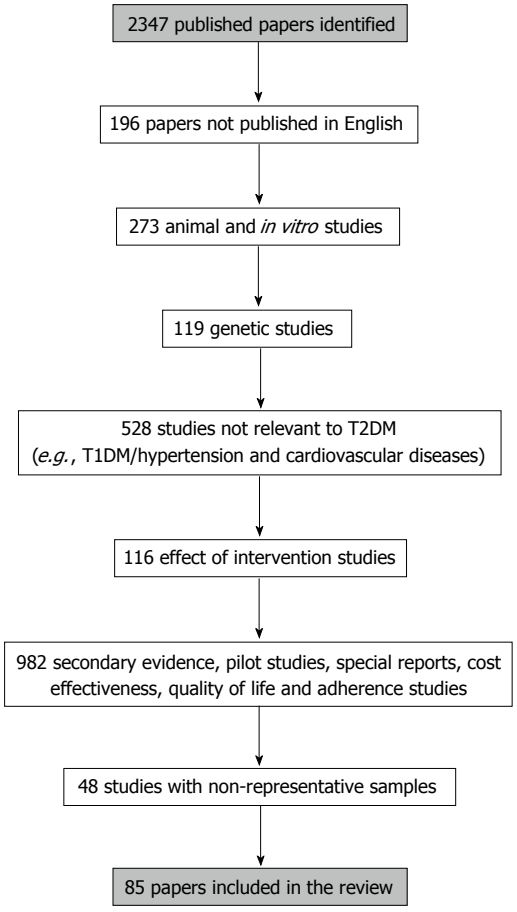

Figure 2 Research scheme and exclusion criteria. T2DM: Type-2 diabetes mellitus; T1DM: Type-1 diabetes mellitus.

Obesity

Obesity represent a large component in the pathogenesis of T2DM[13], and is by far the primary risk factor for the increased prevalence of T2DM globally[14]. Obesity not only worsens the prognosis of T2DM, but obese diabetics suffer higher rates of microvascular complications and mortality[15-18]. Obesity-related T2DM has been investigated in several countries in the Arab world. In Saudi Arabia, a study of 14252 diabetic patients reported that more than half of the obese diabetics had poor glycemic control[19]. Additionally, the first national health survey in Kuwait indicates that 48% obese males and 77% obese females were also diabetics[20], confirming a significant association between obesity and diabetes [odds ratio (OR) of 2.87] in the Kuwaiti population. In Oman and Qatar, 60.1% and 59.7% of the diabetic patients were obese respectively[21,22]. The average body mass index (BMI) in Palestinian and Lebanese diabetics was 33.7 kg/m^2 and 30.8 kg/m^2 respectively[23,24]. Nevertheless, obesity is significantly associated with diabetes even in some Arab countries such as Sudan and Tunisia where the prevalence of diabetes can be described as relatively low - the relative risk of developing T2DM was 1.74 (95%CI: 1.32-2.28) in obese Sudanese subjects and the OR of having T2DM was 1.61 (95%CI: 1.34-1.93) in obese Tunisians[25,26].

A recent analysis of 46 Muslim countries (where Muslims represent > 50% of the population) estimated the prevalence of overweight subjects reported that in the Eastern Mediterranean region, females were more likely to be overweight than males (42.1% *vs* 33%)[27]. Interestingly, those living in Arab countries were 2.92 (95%CI: 2.86-2.97) times more likely to be overweight compared to those living in non-Arab Muslim countries.

Rapid urbanization

Urbanizing of many rural areas within the Arab world carries with it many advantages in term of access to

Table 1 Prevalence of type-2 diabetes mellitus in adult Arab population

Ref.	Country	Year	Sample size	Main findings	Diagnostic technique
Bacchus *et al*[8]	Saudi Arabia	1982	1385	Prevalence of diabetes: 2.4%	WHO criteria
Fatani *et al*[9]	Saudi Arabia	1987	5222	Prevalence of diabetes: 4.3%	Random capillary blood glucose
Al-Nuaim *et al*[28]	Saudi Arabia	1997	13177	Prevalence of diabetes in urban males and females: 12%, 14% Prevalence of diabetes in rural males and females: 7%, 7.7%	Random plasma glucose
Rahman Al-Nuaim *et al*[47]	Saudi Arabia	1997	2059	Prevalence of T2DM in obese males: 26.0% Prevalence of T2DM in non-obese males: 8.6% ($P < 0.001$) Prevalence of T2DM in obese females: 23.5% Prevalence of T2DM in non-obese females: 4.4% ($P < 0.0001$)	OGTT
el-Hazmi *et al*[48]	Saudi Arabia	2000	14660	Prevalence of obesity in males: 13.05% Prevalence of obesity in females: 20.26% Prevalence of obesity in diabetics: 29.98% Prevalence of obesity in non-diabetics: 15.87% ($P < 0.0001$)	FBG
Al-Nozha *et al*[49]	Saudi Arabia	2004	16917	Prevalence of diabetes: 23.7%	FPG
Almajwal *et al*[50]	Saudi Arabia	2009	195851	Prevalence of diabetes: 17.2%	FBG
Al-Rubeaan *et al*[10]	Saudi Arabia	2014	18034	Prevalence of diabetes: 25.4%	FPG
Al-Rubeaan *et al*[51]	Saudi Arabia	2014	53370	Prevalence of abnormal glucose metabolism: 34.5%	FPG
El Bcheraoui *et al*[52]	Saudi Arabia	2014	10735	Prevalence of diabetes: 13.4%	FPG
Abdella *et al*[53]	Kuwait	1996	8336	Prevalence of diabetes: 7.6%	Medical chart review
Al Khalaf *et al*[54]	Kuwait	2010	560	Prevalence of diabetes: 21.4%	FBG
Alarouj *et al*[20]	Kuwait	2013	1970	Prevalence of diabetes: 17.9%	FPG
Al Zurba *et al*[55]	Bahrain	1996	498	Prevalence of diabetes: 25.5%	FPG
Malik *et al*[56]	UAE	2005	5758	Prevalence of T2DM: 20.2%	FPG
Saadi *et al*[57]	UAE	2007	2455	Prevalence of diagnosed T2DM: 10.5% Prevalence of undiagnosed T2DM: 6.6%	FBG
Mansour *et al*[58]	Iraq	2007	13730	Incidence of T2DM: 6.8%	FPG
Mansour *et al*[59]	Iraq	2014	5445	Prevalence of T2DM: 19.7%	FPG
Al-Moosa *et al*[21]	Oman	2006	5840	Prevalence of T2DM: 11.6%	FPG
Al-Lawati *et al*[60]	Oman	2015	NA	Age-adjusted prevalence of T2DM: 10.4% to 21.1%	FPG and OGTT
Musaiger *et al*[61]	Qatar	2005	535	Prevalence of T2DM among obese females ≥ 50 yr: 51.4%	Self-reported diabetes
Bener *et al*[22]	Qatar	2009	1117	Prevalence of T2DM: 16.7%	FBG and OGTT
Al-Habori *et al*[62]	Yemen	2004	498	Prevalence of T2DM: 7.4%	FPG
Gunaid *et al*[63]	Yemen	2008	250	Prevalence of T2DM: 10.4%	FPG and OGTT
Abdul-Rahim *et al*[23]	Palestine	2001	302	Prevalence of T2DM: 12%	OGTT
Ajlouni *et al*[64]	Jordan	2008	1121	Prevalence of T2DM: 17.4%	FPG
Albache *et al*[65]	Syria	2010	806	Prevalence of T2DM: 15.6%	FPG
Hirbli *et al*[66]	Lebanon	2005	3000	Prevalence of T2DM: 15.6%	FPG
Herman *et al*[67]	Egypt	1998	1451	Prevalence of T2DM: 9.3%	OGTT
Abolfotouh *et al*[68]	Egypt	2008	1800	Prevalence of T2DM: 3.7%	FBG
Elbagir *et al*[25]	Sudan	1996	1284	Prevalence of T2DM: 3.4%	OGTT
Noor *et al*[69]	Sudan	2015	1111	Prevalence of T2DM: 1.3% Prevalence of undiagnosed T2DM: 2.6%	FBG
Bouguerra *et al*[26]	Tunisia	2007	3729	Prevalence of T2DM: 9.9%	FPG
Ben Romdhane *et al*[70]	Tunisia	2014	7700	Prevalence of T2DM: 15.1%	FPG
Kadiki *et al*[71]	Libya	2001	868	Prevalence of T2DM: 14.1%	OGTT
Rguibi *et al*[72]	Morocco	2006	249	Prevalence of undiagnosed T2DM: 6.4%	FPG
Bos *et al*[29]	North Africa	2013	NA	Prevalence of diabetes: Range from 2.6% in rural Sudan to 20.0% in urban Egypt Prevalence of diabetes significantly higher in urban than rural areas Significantly higher prevalence of overweight/obesity in females than males in Algeria, Egypt, Morocco, Tunisia and Sudan	NA
Jaber *et al*[73]	United States (Arab-Americans)	2003	542	Prevalence of T2DM in males: 22.0% Prevalence T2DM in females: 18.0%	OGTT
Rissel *et al*[74]	Australia (Arab immigrants)	1998	528	Prevalence of overweight or obesity in males: 73% Prevalence of overweight or obesity in females: 36%	NA
Thow *et al*[75]	Australia (people born in Middle East and North Africa)	2005	NA	Highest prevalence and incidence of T2DM Second highest ratio of hospitalization and mortality Standard prevalence ratio for diabetes among Arabic-speaking subjects significantly 3.6 times higher than English-only speaking subjects	NA

WHO: World Health Organization; OGTT: Oral glucose tolerance test; FBG: Fasting blood glucose; FPG: Fasting plasma glucose; UAE: United Arab Emirates; NA: Data not available; T2DM: Type-2 diabetes mellitus.

Table 2 Prevalence of type-2 diabetes mellitus in Arab podiatric and children

Ref.	Country	Year	Sample size	Main findings	Diagnostic technique	Notes
Punnose *et al*[76]	UAE	2005	96	11 children diagnosed with T2DM 9/11 children were Arab origin 8/11 children were overweight or obese 10/11 children were female	FPG	(8-18 years old) Case series
Moussa *et al*[6]	Kuwait	2008	128918	T2DM found in 45 children Prevalence of T2DM in male children: 47.3/10000 Prevalence of T2DM in female children: 26.3/10000 (P = 0.05)	NA	(6-18 years old) Medical record review
Al-Agha *et al*[77]	Saudi Arabia	2012	387	Prevalence of T2DM: 9.04%	NA	(2-18 years old) Retrospective cross-sectional study
Al-Rubeaan *et al*[7]	Saudi Arabia	2015	23523	Age adjusted Prevalence of T2DM: 1/1000	FPG	⩽ 18 yr
Ali *et al*[78]	Egypt	2013	210	28 out of 210 children with diabetes diagnosed with T2DM 64.3% of T2DM children were female (P = 0.04)	Fasting serum C-peptide levels	(1-18 years old)
Osman *et al*[79]	Sudan	2013	958	38/985 children identified with T2DM 32/38 of cases were from tribes of Arab origin	NA	(11-18 years old) Retrospective cross sectional
Ehtisham *et al*[80]	United Kingdom	2000	8	First 8 cases reported with T2DM in United Kingdom All cases were overweight and originated from India, Pakistan and Arab countries	NA	(9-16 years old) Retrospective cross sectional

UAE: United Arab Emirates; FPG: Fasting plasma glucose; NA: Data not available; T2DM: Type-2 diabetes mellitus.

improved medical services, access to education and other "modern" conveniences. There are significant differences in the rate of T2DM between rural and urban communities. For example, an early study in Saudi Arabia found that the prevalence of T2DM in urban communities was 12% and 14% in males and females respectively, which was nearly double the prevalence of T2DM in males and females residing rural areas (7% and 7.7% for males and females respectively)[28]. Another study in Oman indicated that urban residence was significantly associated with T2DM (OR = 1.7, 95%CI: 1.4-2.1), with the prevalence of T2DM was 17.7% and 10.5 in urban and rural areas respectively[21]. Moreover, a systematic review of the prevalence of T2DM in North Africa found that the prevalence of T2DM ranged from 2.6% in rural Sudan to 20.0% in urban Egypt[29].

Dietary habits

The Mediterranean diet is considered to be one of the healthiest food options available, as it contains a variety of fruits, vegetables, grains and olive oil. In fact, several studies have shown significant reduction in the rate of T2DM with the Mediterranean diet[30,31]. However, one is unlikely to obtain the health benefits of the Mediterranean diet without proper adherence, which may be a common habit in most of the Eastern Mediterranean countries. In a comparative risk assessment analysis, data from the United Food and Agricultural Organization was used to estimate the dietary intake of 20 countries in the Middle East and North Africa[32]. These estimates were used to provide a country specific estimates of cardio-metabolic disease mortality secondary to 15 different dietary and metabolic risk factors. This analysis shows that there is suboptimal intake of the "protective" diets (*e.g.*, fruits, vegetables and sea food), and greater consumption of "harmful" diets (*e.g.*, processed meat and trans fatty acids). These results were reflected in the cardio-metabolic disease mortality rate, where non-optimal BMI was the second leading metabolic risk factor for cardio-metabolic disease mortality, accounting for 21% of all cardio-metabolic mortality risk factors, followed by high fasting blood glucose (> 5.3 mmol/L) which accounted for 17% of all cardio-metabolic disease deaths.

Sedentary life style

Numerous studies confirm that physical activity reduces the incidence and/or severity of T2DM[33-35]. Six years of leading an active life coupled with a healthy diet can reduce the incidence of T2DM by 43% in subjects with impaired glucose tolerance followed for 20 years[36]. Another meta-analysis shows that exercise training reduces glycosylated haemoglobin (HbA1c) by 0.66% in type-2 diabetic patients, a percentage that should substantially reduce the complications of T2DM[37]. Not surprisingly, a sedentary life style is one of the most important modifiable risk factors in the Arab world, specifically when comparing the prevalence of highly active subjects in the Arab world with the global data. Among 52746 subject from 20 countries included to study the prevalence of physical activity, 8 countries reported that more than 50% of the population are highly active based on the international physical activity questionnaire[38]. Saudi Arabia, which was the only country from the Arab world that was included in their analysis, is reported to have 26.2% of their population as being highly active. More recent data came from a study over 10 Eastern Mediterranean countries indicating that the highest level of physically active adolescents were in the Emirates (23.9%), while the lowest was in Egypt

Table 3 Diabetes complications in the Arab world

Country	Year	Sample size	Prevalence of complication	Ref.
Saudi Arabia	2015	50464	Retinopathy: 19.7%	[81]
	2015	3800	Blindness: 33%	[82]
	2014	54670	Nephropathy: 10.8%	[83]
	2015	62681	Diabetic foot: 3.3% Foot ulcer: 2.05% Gangrene: 0.19% Amputation: 1.06%	[84]
	2014	552	Peripheral neuropathy: 19.9%	[85]
Kuwait	2007	165	Retinopathy: 40%	[86]
Emirates	2007	513	Retinopathy: 19%	[87]
	2007	2455	Retinopathy: 54.2% Nephropathy: 40.8% Neuropathy: 34.7% Peripheral vascular disease: 11.1%	[57]
Bahrain	2009	712	Microalbuminuria: 27.9%	[88]
	2007	1477	Neuropathy: 36.6% Foot ulcer: 5.9% Peripheral vascular disease: 11.8%	[89]
Qatar	2011	540	Retinopathy: 23.5%	[90]
	2014	1633	Retinopathy: 12.5% Nephropathy: 12.4% Neuropathy: 9.5%	[91]
Oman	2003	2249	Retinopathy: 14.9%	[92]
	2009	418	Retinopathy: 7.9%	[93]
	2012	2551	Microalbuminuria: 37% Nephropathy: 5%	[94]
	2012	699	Nephropathy: 42.5%	[95]
Yemen	2011	694	Blindness: 15.7%	[96]
	2009	350	Retinopathy: 55%	[97]
	1997	1095	Peripheral neuropathy: 40.7%	[98]
	2010	311	Peripheral vascular disease: 9.1%	[99]
Jordan	2015	3638	Blindness: 1.3% Severe visual impairment: 1.82% Correctable visual impairment: 9.49%	[100]
	2008	986	Retinopathy: 64.1%	[101]
	2005	986	Blindness: 7.4%	[102]
	2003	1142	Microalbuminuria: 33% Ulceration: 4% Amputation: 5%	[103]
Egypt	2011	1325	Retinopathy: 20.5%	[104]
	2015	2000	Neuropathy: 29.3% Peripheral vascular disease: 11%	[105]
	1998	4600	Retinopathy: 42% Blindness: 5% Nephropathy: 7% Neuropathy: 22% Foot ulcer: 1%	[67]
Tunisia	2014	2320	Retinopathy: 26.3%	[106]
Libya	2012	260	Retinopathy: 16.2% Nephropathy: 1.5% Neuropathy: 11.2%	[107]

(9.2%), giving an overall prevalence of physically active adolescents in the Eastern Mediterranean countries of 19%[39].

Other factors

Several factors can explain the unrestrained raise in the rate of T2DM in the Arabian area. Some are attributed to the Eastern cultural heritage from a hundred of years ago, such as multiple pregnancies and cultural barriers for women's physical activity. However, despite no changes in the traditional risk factors for T2DM in Arabian area, there is an alarming increase in the prevalence of diabetes, particularly within the last two decades - suggesting that recent lifestyle changes may have greater effect on this crisis. The global change impacts the Arab nations even more dramatically than elsewhere: Temperatures that are already scorching on a regular basis are now increased (higher temperatures for longer periods), even more increases in polluted and dusty air. These conditions combine to further discourage many people - regardless of age or gender - from any kind of outdoor activity. The situation is made even worse by the political instability in many of these countries, which affects access to healthy food and medical care.

COMPLICATIONS

According to the World Health Organization, diabetes is the 8th leading cause of death in the world[40]. Data published specifically from the Arab world shows a similar trend to that available globally. A recent analysis indicates that diabetes represents the 5th leading cause of death in the Arab world in 2010, compared to it being the 11th leading cause of death in 1990[41]. Living with T2DM is troublesome as well, as diabetes is the 5th leading cause for the disability-adjusted life years in high income Arabic countries in 2010, compared to it being ranked as the 10th reason in twenty years earlier[41]. The studies summarized in Table 3 summarize the most recent data on the prevalence of common complications (retinopathy, nephropathy, neuropathy and peripheral vascular diseases) in diabetic patients from the Arab world.

FUTURE DIRECTIONS

The high prevalence of T2DM in Arab nations offers an opportunity to better understand the disease and its treatment. Unfortunately, current research in the Arab nations does not match the level of this health crisis in the area. Large portions of critical data information are unavailable in many countries from the Arab world. For instance, predicting the prevalence of T2DM statistically could crucial in formulating a strategic plan for combating the disease, which requires comprehensive knowledge about its current burden, for which data is available only from Tunisia and Saudi Arabia. The Tunisian study revealed that the prevalence of T2DM in Tunisia will reach 26.6% in 2027[42]. Moreover, it predicts that a 20% reduction in obesity and smoking will yield in a 3.3% reduction in T2DM by 2027. On the other hand, the Saudi study indicates that the prevalence of T2DM in Saudi Arabia could reach 44.1% in 2022, a figure which differs significantly from IDF estimates[43].

It would be important to apply the recommendations on physical activity discussed at conference on Healthy Lifestyles and Non-Communicable Diseases in the Arab World and the Middle East, also called the "Riyadh

declaration"[44]. To successfully implement the recommendations of the Riyadh declaration, novel research is needed to determine the social determinants for developing diabetes in the Arab world. For instance, a population based longitudinal cohort of 5124 diabetes-free participants in United States revealed that people residing neighborhoods with fewer opportunities for physical activity have nearly double the risk of developing T2DM[45].

Considering the epidemic nature of obesity and T2DM in the Arab world, studies on the ethnic-specific obesity cut-off points for the risk of diabetes are certainly necessary for peoples of the Arab and North African populations. For example, the risk of diabetes increases with BMI values greater than 25 kg/m^2 for South Asians, at 27 kg/m^2 for African-Caribbeans and at 30 kg/m^2 for Europeans[46].

CONCLUSION

The data obtained from the Arabic world indicates that there is an uncontrolled rise in the prevalence of T2DM over the last two decades, in particular within the Gulf cooperation countries. For example, the prevalence of T2DM in early 1980's was estimated 2.4%[8], and then increased to 12% in the late 1990's[28], while recent data from Saudi Arabia shows that the prevalence of T2DM reached 25.4% in 2014. Given that obesity is a major risk factor for developing T2DM, obesity is associated with T2DM in Arab countries even where the prevalence of T2DM is relatively low. In addition, other factors such as rapid urbanization, unhealthy dietary habits and the lack of physical activity are key determinants of T2DM in the area. With this uncontrolled rise in the rate of T2DM in the Arab world, T2DM has now become the 5th leading cause of death in the Arab world. To better estimate the size of this crisis, studies aimed at predicting the rate of T2DM in the future are urgently needed. However, the vast majority of Arabian countries do not provide this important information. In order to successfully contain the uncontrolled rise of T2DM in the Arabian region, one should take advantage of the research conducted in other communities facing similar patterns in the increasing rates of diabetes. For example, genetic studies, ethnic-specific obesity cut-off points for the risk of diabetes studies and community studies to assess the appropriateness of the neighborhoods for physical activity may bring about increased awareness on the epidemic of diabetes sweeping the region-and so help in creating national/regional strategies to successfully limit the widespread firestorm of T2DM ravaging the Arabic region.

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Comment on: Statin use and risk of diabetes mellitus

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Abstract

In manuscript named "Statin use and risk of diabetes mellitus" by Chogtu *et al*, authors defined that pravastatin 40 mg/dL reduced the risk of diabetes by 30% in West of Scotland Coronary Prevention study. In fact, pravastatin 40 mg/dL reduced coronary heart disease risk approximately 30% in mentioned study.

Key words: Pravastatin; Statins; Diabetes mellitus; Coronary heart disease; Myocardial Infarction

Core tip: We want to eliminate an important error that lead to confusion about the risk of diabetes due to statins in the well-written manuscript by Chogtu *et al*.

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TO THE EDITOR

We read with great interest the recent review by Chogtu *et al*[1] ealing with the risk of diabetes mellitus development induced by the use of statins. The authors clearly explained the benefit of statin on cardiovascular prevention as well as the possible mechanism of impaired glucose metabolism related with statin. In our opinion, there was a critical confusing error in "statins in diabetes" section.

In the last sentence of mentioned section, authors defined that pravastatin 40 mg/dL reduced the risk of diabetes by 30% in West of Scotland Coronary Prevention study with reference to the Kotseva *et al*[2]. However, pravastatin 40 mg/dL reduced nonfatal myocardial infarctions risk by 31%, death from coronary heart disease by 28%, death from all cardiovascular causes by 32% but there was no information about diabetes risk in the original study of West of Scotland Coronary Prevention Study Group[3].

We hope that the correction of above-mentioned item would eliminate the confusion and provide better understanding of the well-written manuscript by Chogtu *et al*[1].

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