

A Review of Impact of Diabetes Mellitus in Middle East

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Abstract

Introduction: Diabetes Mellitus (DM) driven from Greek and Latin referring to sweetened honey in urine is on the top list of health diseases in the world that is growing quickly, where some countries are on the edge of epidemic proportions. The cause of Diabetes Mellitus is primarily due to the consequences of sedentary life-style, some examples include less outdoors activity, eating junk food, and obesity. On the top 10 list of countries which Diabetes Mellitus is common and prevalent, kingdom of Saudi Arabia ranks as the seventh in position.

Aim of the Study: In this study, our aim is to study the prevalence of diabetes mellitus in the Middle East, with special reference to Saudi Arabia, and study its impact.

Methodology: A comprehensive and systematic search was conducted regarding a review of impact of diabetes mellitus in Middle East using PubMed search engine (<http://www.ncbi.nlm.nih.gov/>) and Google Scholar search engine (<https://scholar.google.com>) were the mainly used database.

Conclusion: The Diabetes Mellitus management should focus on the cooperation of the health care team and close follow up with the patient which help avoiding chronic complications. Promoting public awareness aggressively, early intervention and continued screening are important to boosting a positive response. An important consideration is to keep eye on the programs which provides awareness of diabetes, community-based campaigns that provides checkups for DM and programs that educate about methods of improving health related issues that appear as a complication of diabetes, which in the long term helps improve the national burden of the illness.

Keywords: Diabetes Mellitus; Middle East; Saudi Arabia; Lifestyle

Introduction

Diabetes Mellitus (DM) driven from Greek and Latin referring to sweetened honey in urine is on the top list of health diseases in the world that is growing quickly, where some countries are on the edge of epidemic proportions. The cause of Diabetes Mellitus is primar-

ily due to the consequences of sedentary life-style, some examples include less outdoors activity, eating junk food, and obesity. Tokelau (37.5%), Federated States of Micronesia (35%), Marshall Islands (34.9%), Kiribati (28.8%), Cook Islands (25.7%), Vanuatu (24%), kingdom of Saudi Arabia (23.9%), Nauru (23.3%), Kuwait (23.1%) and Qatar (22.9%) are on the list of top ten countries that have the greatest prevalence of diabetes. In estimation, 382 million individuals are suffering with diabetes around the world with a prevalence of 8.3%. In conclusion Saudi Arabia, Kuwait, and Qatar are along the top ten countries of the world with greatest prevalence [1].

Inactive routine which is one of the top risk factors relating to type 2 diabetes, is a result of urbanization and increased income leading to high rates of sedentary routine and obesity which led to the remarkable increase in the illness. Additionally, high caloric diet of increased food intake from animal products and refined food is the result of socio-cultural changes. Other important risk factors that contribute to the high prevalence of diabetes are hyperlipidemia, smoking and hypertension [2-4].

A study that was on the sixth edition of international Diabetes Federation Atlas of the year 2013 which results were found in other older studies in epidemiology that support it found that kingdom of Saudi Arabia was ranked number 7 in the top 10 countries known for their importance in diabetes prevalence, and this rank is expected to be number 6 by the year of 2035. The Saudi Abnormal Glucose Metabolism and Diabetes Impact Study (SAUDI-DM) was published to test for the Diabetes Mellitus prevalence and related side effects, in addition to its socio-economic impact [5].

Methodology

A comprehensive and systematic search was conducted regarding a review of impact of diabetes mellitus in Middle East using PubMed search engine (<http://www.ncbi.nlm.nih.gov/>) and Google Scholar search engine (<https://scholar.google.com>) were the mainly used database. All relevant available and accessible articles were reviewed and included.

The terms used in search were: diabetes mellitus, middle east, Saudi Arabia, Lifestyle, complications of diabetes mellitus.

Prevalence in the middle east

Majeed., *et al.* [6] reported the prevalence of Diabetes Mellitus in the Middle East and North Africa (MENA) region and his study yield that the prevalence in Saudi Arabia was 23.87%, Kuwait 23.09%, Qatar 22.87%, Bahrain 21.84%, UAE 18.98%, Egypt 16.80%, Lebanon 14.99%, Oman 14.24%, Jordan 11.40%, and Iran 9.94%. Another report by Meo., *et al.* [7] showed that in Arab-speaking countries, the prevalence of Diabetes Mellitus was greater in GCC states. The most prevalent region affected by Type 2 diabetes mellitus is the middle east which is found in this study. Countries such as kingdom of Saudi Arabia, Bahrain, United Arab Emirates, and Kuwait are among the highest prevalence with type 2 diabetes mellitus, where countries such as Yemen and Iran are among the least prevalent. A meta-analysis method which is used to join the outcome of different studies known as the random pooled prevalence in GCC states is found that 24.0%, in non-GCC states was 16.0%, and in GCC and non-GCC countries altogether, was 19.0%. The prevalence was greatly associated with the respective GDP of these states.

The growing prevalence of type 2 diabetes mellitus in regions such as middle east is led by features such as less exercises, inactive daily routine, overweight, wealth, urbanization, and mutation that are accompanied with diabetes which can be a region-specific leading to be the main reason for the rising prevalence in the region [8].

Musaiger [9] reported that in Bahrain, that Diabetes Mellitus in Bahraini individuals was 0.8% in 1980, and in the following 2 years, it was 10.2%. In the year of 1996, an epidemiological study among Bahraini population and found that Diabetes Mellitus prevalence was 25.5% in men. 25.5% of Individuals from Bahrain who's age were 20 and above, were reported to be Type 2 diabetes mellitus in Another study [10].

Few studies were performed in Saudi Arabia to identify and assess the prevalence of T2DM. In the year of 1990, the prevalence of diabetes mellitus was 6%; in 1997, 10.3%; and in 2004 it went up to 23.7%. men from the kingdom of Saudi Arabia were found to have a

high prevalence of type 2 diabetes mellitus that reached 29.8% in one recent literature. these rising patterns of type 2 diabetes mellitus affirms All these studies. The current study describes Type 2 Diabetes Mellitus prevalence is quickly increasing among men in the Middle East countries [1,10,11].

Kuwait is as well facing the rising incident of T2DM. A report by Al Khalaf., *et al.* [12] described 21.4% prevalence of diabetes in the Kuwaiti natives while another report by Channanath., *et al.* [13] identified that the crude prevalence of T2DM in Kuwait was 25.4%. individuals in UAE were found to have increased percentage with age, in prevalence of diabetes mellitus which was around 25%, where it is similar with crude prevalence in Kuwait.

In Oman, A report by Al-Lawati., *et al.* [14] identified that the crude prevalence of Diabetes Mellitus was 16% in men. Around the percentage of 21% and 22% in Dhofar and Adh-Dhahirah zones, greater in developed than developing areas.

One study which was performed in Qatar, the authors found out that the average prevalence of Diabetes Mellitus among adult Qatari individuals was 16.7%, increasing up to 29.2% among individuals aged 30 - 49 years. Type 2 Diabetes Mellitus prevalence has also increased in non-GCC states of the Middle East [15].

The following countries with their percentages of Type 2 diabetes mellitus prevalence since the past few years includes, Jordan rising from 13.0% to 17.1%, Egypt's is 17%, Syria with 15.6%, state of Palestine 12.0% of their population where areas of rural individuals aging 25 - 65 years were 9.7% in 2000 and went up to 15.3% in the year of 2010, and Yemen with 6.57%. however, ages from 30 - 64 years were 9.75% in Yemen. conclusions were made where crude prevalence of type 2 diabetes mellitus in Yemen's capital city was 10.4% [16-18].

Risk factors associated with high diabetes mellitus in Saudi Arabia

DM risk factors can be categorized in 2 categories which are modifiable and non-modifiable. The modifiable risk factors are diets that are rich in fat, decreased physical activity, raised BMI, increased blood pressure (above 140/90), metabolic syndrome and increased plasma triglyceride levels. Risk factors that are non-modifiable include an age (above 40 years) and a history in the family of DM. The increased prevalence of T2DM in the population of Saudi is linked to the increased levels of obesity because of the rapid urbanization of the country that has encouraged physical inactivity and the promotion of a diet richer in fat. Midhet., *et al.* [19] carried out a case-control study to assess the risk factors lifestyle-related risk factors of Type 2 Diabetes Mellitus in Saudi Arabia. A significant association was seen between lifestyle and Type 2 DM. Maternal diabetes, level of education, inactivity, and poor diet was significant risk factors. The odds ratio adjusted for these risk factors are:

- Regularly consuming Kabsa OR = 5.5 (95% CI 2.3 to 13.5)
- Eating vegetables OR = 0.4 (95% CI 0.2 to 0.7)
- Eating dates OR = 1.8 (95% CI 1.0 to 3.3) and sedentary lifestyle OR = 2.5 (95% CI 1.2 to 5.0).

Murad., *et al.* [20] conducted a case-control study that was in Jeddah to assess the risk factors for T2DM. They noted that smoking, obesity, hypertension, and age (> 40 years) were significant risk factors for Type 2 DM among the studied population. Alfadhli., *et al.* [21] found that increased maternal age, increased BMI, increased blood pressure, history of gestational diabetes (GDM), previous malformed child and a family history of diabetes were the main risk factors for GDM.

Quality of life (QoL) and health related quality of life (HRQoL)

It is known that diabetes can lead to a serious deterioration in general QoL (by mainly affecting the HRQoL). The results are similar across the world, varying in degree of influence. Most important is that there are studies that imply anxiety and depression in individuals with low QoL who haven't yet been diagnosed officially for diabetes but are at a high risk for diabetes. For that reason, it should be taken into consideration that education should be provided to physicians that individuals at risk for prediabetic state might have a decrease overall in HRQoL and depression and their health dimension [22].

In between three populations, Indian, Chinese, and Malaysian, it was found that there was a great difference in quality of life which was conducted by a study in Malaysia. When compared, the Chinese had a greatly lower score (21.0 ± 4.3) in the Asian DQOL to Malays (81.4 ± 9.0) and the Indians (81.5 ± 9.2).

Varying perception of food intake between other ethnic individuals was the only different component in an in-depth analysis. Additionally, sexual dysfunction was also found to persistently lead to lower Quality of life in this existent study (-5.9%, in Mandarin speaking Chinese, -10% in English speaking -6% in Malaysians traditional language speaking) in all sub groups while there were found to be differences in the other predictors [23]. One important feature was found to be controlling quality of life in individuals with diabetes was their ethnicity, this study was conducted in Singapore by Wee., *et al.* [24] in 2005 which is related to the prior study.

Results on Health-Related Quality of Life showed less scores specifically regarding type 2 diabetics from surveys which was conducted on Nordic people in hospitals which signify difference among poor glucose tolerance and the overt diabetics. Older patients and those with poorer control show lower scores. The most significant factor in Nordic studies for the poor HRQoL was the complications, especially Coronary artery disease and some non-vascular complications e.g. minor psychiatric disorders or some musculoskeletal disorders. Vinamäki, *et al.* [25] on the other hand discovered no increase in the rate of minor mental disorders in diabetic patients. However, complications were great when found together. Neuropathy was seen as a predictor of mental disorders. However, Microvascular outcomes did not show outstanding effect in Health-Related Quality of Life. Proper care and fitted and tailor suited management without missing doses helps therapy and showed promising outcomes.

For Diabetes Treatment Satisfaction Questionnaire (DTSQ) and Health Related Quality of Life (HRQoL) a study in Europe was conducted that began with the cost of Diabetes Type 2 - (CODE-2), a Dutch population of 1371 type 2 diabetic patients were questioned using EQ-5D and EuroQol VAS scores. A link between EQ-5D and EuroQol Vas scores were established and found to be correlated as what the results revealed even though scores in one did not necessarily mean similar scores in other. Decreased scores were reported as the age increased, in female gender, with obesity, with the use of insulin and as the complications appeared.

Low scores were especially seen for the combined microvascular and macrovascular complications. Anxiety and depression were seen to be increased and then decreased with patient age. The writers explained that elderly people attribute these limitations to increased age and adjust or accept them better than the younger people do. Additionally, fear of future complications was greater in younger individuals.

Duration of diabetes, interestingly, doesn't correlate with HRQoL and neither does treatment satisfaction. The latter has an association with the attitude of physicians with the patients and the level of communication they have between them. People with diabetic neuropathy were seen to have lower scores than those with foot ulcers [26].

In one more cross sectional study that was conducted in United States, Self-Administered Quality of Well Being index (QWB-SA) was checked on 2048 diabetics with type 1 and type 2 diabetes. Health scores were seen to be decreased in women and the patients with obesity, and in those with kidney disease and arterial hypertension. Scores were seen to be significantly less in patients with patients who suffer from Diabetes Type 1 and its complications like neuropathy, retinopathy, amputation, foot ulcers, congestive heart failure, and stroke. Patients that had followed a diabetic diet, do not suffer of obesity, without neuropathic, microvascular, or cardiovascular complications were among the highest of scores. Identical findings were seen in type 2 diabetics. In the end, the authors inferred that there could be a link between lower education and a decrease in the scores but the writers also concluded that the sample was not accurate [27].

One method was used in which scores were matched to the chart information provided in the clinic which are SF36 and BRFSS (recommended by the CDC, which correlates to healthy/unhealthy days and limitations). 37% of patients who were non-diabetic responded while 57% of patients who suffered from diabetes responded. retinopathy (15% vs 14%), coronary artery diseases (CAD) (16% vs 19%),

cerebrovascular disease (9% vs 8%), peripheral vascular disease (7% vs 7%), kidney diseases (6% vs 7%), and CNS diseases (9% vs 10%) are complications which are considered in the sample taken as a representative of all individuals of diabetics of the area. Less scores were observed in diabetics in Health-Related Quality of Life. Insulin, period in which patients are diabetic, and prolonged complications with diabetes are Factors related to Quality of Life scores. One association which was found to be unusual is lesser HbA1c levels. Quality of Life and diabetes were found to be in an inverse relationship. Diabetes was seen to show improvement in QoL with age while some studies reported similar outcomes [28].

Interestingly there were similar results seen in many Iranian studies. Most of which were type 2 diabetes and some type 1 diabetes that are Under the topic of the quality of life in diabetics. Positive association with Health-Related Quality of Life is Marital status and socioeconomic level, while female gender and elderly had lower Health-Related Quality of Life than men did. There was an inverse relation seen between HbA1c, blood pressure, BMI, lipids, and HRQoL. lesser Health-Related Quality of Life was observed in smokers, whereas unusual outcomes were observed related to the duration of diabetes and a study among rural urban population [29].

A mean EQ-5D index value of 0.83 was observed on patients with type 2 diabetes mellitus with no complications in UKPDS 37 study [30], in comparison with a Norwegian study that yielded 0.85 in the year of 2006 where mail was used. Microvascular complications were not caught in the EQ-5D however, it caught major differences among the patients with and without the macrovascular complications in UKPDS 37 study. Lesser Health-Related Quality of Life were shown in patients who had symptomatic complications a cross sectional study by Quah., *et al.* [31] Along the same lines in Singapore, where he used EQ5D and SF36 on 699 patients suffering from diabetes. This was seen to be fairly consistent with many other studies.

Complication and comorbidities accompanied with diabetes mellitus

As we noted in many studies, diabetes mellitus begins its dark influence when complications start to make their presence in patients' lives. Hypertension or dyslipidemia either of them become apparent in over 80% of diabetics and over half were obese. Retinopathy was associated with high EQ-5D index while Renal diseases, CNS complications and Coronary Artery Disease were not. In particular, hypertension was also involved with EQ-5D index. The results were consistent with a study done in Singapore, while Dutch and Norwegian studies involving Caucasian populations had lower scores [32]. It was observed that Quality of Life was majorly affected by diabetic complications in multiethnic environment in a study done by Goh., *et al.* [23] in China.

In a study done by Solli., *et al.* [33] in Norway, showed patients with complications had reduced HRQoL; 0.90 for those with type 1 diabetes and 0.85 for those with type 2. A diabetic complication of 2 or more lessens the score to 0.55 and 0.64, respectively, while the appearance of one complication lessens scores to 0.76 and 0.80, respectively. Cerebrovascular disease and neuropathy had a bad impact on overall HRQoL in type 1 and type 2 diabetes, while CAD had an impact on those with type 1 diabetes.

Decreased Health-Related Quality of Life were accompanied with older patients with type 2 diabetes, women, insulin injection, overweight, and appearance of complications were observed In a study by Redekop., *et al.* [26] in Netherlands. The rates of Diabetics who suffered of complications which was a survey conducted by The Canadian Bella Cooola in regard to retinopathy (15%), Coronary Artery Disease (16%), cerebrovascular accidents (9%), peripheral vascular disease (7%), neuropathy (9%), and kidney diseases (6%). The scores of SF36 for diabetics were lesser as follows: Physical functioning -13.7, in Social functioning -8.8, in bodily pain -11.1, in physical role -27.4 in emotional role -22, in mental health -3.5 in vitality -6.3, in general health -16.3. Diabetics were found to have more unhealthy days when measured with Mean healthy/unhealthy day scores: +4.4 for physical being unhealthy, +2.3 for mental unhealthiness, +3.4 for limited by health, +5.4 for limited by pain, +1.9 for depression feeling, +3 for felt anxious, +2.6 for sleeping poorly, -1.3 for felt healthy. In a study by Coffey., *et al.* [27] in America, with 2048 of both diabetics. Patients with type 1 diabetes mellitus who suffered of complications such as amputation, brain stroke, congestive heart failure, neuropathy, foot ulcer, and retinopathy scored lesser (0.058 - 0.208). In the other hand, patients with type 2 diabetes mellitus who suffer from neuropathy, stroke, heart failure, retinopathy, end-stage kidney

disease, and diabetic foot Health scores were far less (0.052 - 0.170). using the EuroQol-EQ5D questionnaire, Ragnarson Tennvall., *et al.* [34] also, did an assessment on scores in subjects with diabetic foot problems.

Duration of diabetes and associated diseases, complications of diabetes, and female gender, were the Most important predictors of a bad Health-Related Quality of Life (55.4 in the SF36 psychometric tool). Being single (59.6 in the SF36 psychometric tool), elderly (56.5 in the SF36 psychometric tool), lesser education level (60.5 in the SF36 psychometric tool), Overweight (60.5 in the SF36 psychometric tool), hyperlipidemia (58.8 in the SF36 psychometric tool), and hypertension (62.7 in the SF36 psychometric tool) were associated with Health-Related Quality of Life impairment. Majorly adults with diabetics suffer with at least one associated chronic disease additionally, 40% suffer of at least 3 chronic diseases noted by Piette., *et al.* [35] in an article of 2006. Grouping comorbidities categories are made by authors according to the presence or absence of symptoms (retinopathy, hypertension vs foot ulcer), clinical severity (heart failure or stroke) and, their discordance and concordance to diabetes (dyslipidemia vs low back pain) without clearing the significance of the presence of comorbidities of each category to the evolution of diabetes. Some studies showed that the coexistence of comorbidities actually led to decreased scale scores. In addition to this, a low HRQoL score was seen in several studies that were assessing the co-morbidity of diabetes with other chronic diseases. Predicted score of the diabetics without no complications was actually seen to be somewhat lesser than that of the general population. When co morbidities, however, were present, the score was seen to severely decrease. Three comorbidities together were also accompanied by poor HRQoL. Some studies correspond QoL with exercise, in people with better HRQoL and also overall health showing highest physical activity levels. The types of correlation Wee., *et al.* [36] described between diabetes and other medical conditions are: (1) subtractive; (2) additive and (3) synergistic relationship. He also reported the above mentioned correlation in his study to be additive. Also, he reported diabetes, in comparison to other chronic diseases, to have moderate influence on patients. Interestingly, there is a correlation between comorbid chronic diseases, new line of managements eg immunosuppressive agents, and frank diabetes development in patients with no prior diabetes. Rapamycin, CsA and tacrolimus were shown in this study to affect the lipolysis of adipocytes through various metabolic pathways and different regulatory mechanisms such as IL6, TNF, inhibition of mTORC1 and 2 and subsequent defect in the expression and activation of PPAR γ . This thereby impairs the ability of adipose tissue for lipid clearance of plasma which may contribute to fatty liver, dyslipidemia, and initiation of overt diabetes [37].

Burden in Saudi Arabia

Worldwide, Diabetes imposes a great economic burden on patients suffering diabetes, national healthcare systems, and countries. Expenses related to diabetes compose of 11% of the total healthcare related expenses of 2011 across the globe. The national burden of healthcare expenses due to diabetes is expected to cross about \$0.87 billion even though it looks over the indirect costs that come along with the disease, such as absence from work, decreased productivity due to complications related to disease, early mortality, and unemployment because of the disability caused by the disease. The social burden such as pain and suffering and care provided by caregivers as well as healthcare system administrative costs, cost of medications, clinician training programs, research and infrastructure development is also neglected from this research study. more researches are needed to confirm the current findings and to improve our understanding of economic costs of diabetes and its related complications [38].

Conclusion

The Diabetes Mellitus management should focus on the cooperation of the health care team and close follow up with the patient which help avoiding chronic complications. such as injury to the eyes, kidney, lower extremity and heart. Individuals with diabetes should be managed as soon as possible to prevent early death. Promoting public awareness aggressively, early intervention and continued screening are important to boosting a positive response. An important consideration is to keep eye on the programs which provides awareness of diabetes, community-based campaigns that provides checkups for DM and programs that educate about methods of improving health related issues thar appear as a complication of diabetes, which in the long term helps improve the national burden of the illness.

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