Knowledge and attitude toward diabetes mellitus complications in Saudi Arabia; a systematic review


ABSTRACT
Diabetes is a global burden with increased morbidity and mortality besides increased healthcare costs. The level of knowledge and awareness of diabetes and its complications correlate with the incidence of diabetes complications. It can also help in designing national preventive programs to decrease the burden of these complications. This study aims at examining the literature to evaluate the level of knowledge and attitude toward the complications of diabetes mellitus in Saudi Arabia. In this study, the literature was reviewed through the PubMed database in the duration between 2009 and 2019. The search included terms, such as knowledge, diabetes, and Saudi Arabia. The results were then revised to select original study articles investigating the level of knowledge of the public, including healthcare professionals, on diabetes and its complications. Selected trials mentioned the target population and the type of complications. A total of eight articles were considered as eligible, published between 2009 and 2019, covering a whole of 3,927 responses from the Saudi community about the complications of diabetes. All the studies were qualitative with a cross-sectional design. The study concludes that data on the level of knowledge toward diabetes complications is conflicting. Further large, multicenter studies should be considered to get an accurate estimation of knowledge and practices toward diabetes complications.

Keywords: Knowledge, attitude, diabetes mellitus, complications, Saudi Arabia.

Introduction
Diabetes mellitus is considered as a combination of metabolic disorders which is identified by the presence of hyperglycemia [1]. It is linked to defected carbohydrate, protein, and fat metabolism [2]. Diabetes mellitus can lead to chronic complications. These include neuropathic, micro-vascular, and macro-vascular disorders [3].

Type 2 diabetes is considered as the most common type of diabetes [4]. Type 2 diabetes occurs in about 90%–95% diabetic patients. It is also linked to morbidity and mortality [5]. This can affect the general well-being of patients as well as their quality of life [6]. Therefore, diabetes is considered as a major global health problem [7].

Additionally, type 2 diabetes can affect any age group, even adolescents and young adults [8]. An abnormality in the action of insulin can lead to type 2 diabetes [9]. This makes patients at an elevated risk of macro-vascular and micro-vascular complications, which represents a burden on the economy and can increase healthcare cost [10].

Diabetes mellitus has an increasing incidence globally [11]. It is considered as an epidemic and leads to increased direct and indirect costs [12]. It is estimated that the total number of individuals diagnosed with diabetes is expected to grow from 171 million in the year 2000 to 366 million in 2030 [13].

In the developing countries, the incidence is expected to be much higher; it is estimated to be almost doubled from 2000 to 2030, according to reports from World Health Organization [14]. It is also reported that more than 220

Correspondence to: Yousef Zaben Mesha Alotibi
*Family Medicine, Taif University, Taif, Saudi Arabia.
Email: Mryousefmc@gmail.com

Full list of author information is available at the end of the article.

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Knowledge and attitude toward diabetes mellitus complications

Saudia Arabia is one of the developing countries in the Middle East region, where diabetes mellitus is considered as a primary clinical, as well as public health dilemma [16]. Some studies reported that 23.7% of Saudi individuals have diabetes mellitus, where prevalence in males is higher than females [17].

Additionally, it has been shown that good public education and awareness campaigns can enhance patients’ knowledge and alter their behavior [18]. However, a significant gap was described between the level of knowledge and the attitude toward the disease [19].

In order to start a preventive strategy in a community, the initial step is to educate patients on the prevalence and risk factors of the disease [20]. This is of particular importance in order to develop strategies and programs for good health education [21].

Therefore, this systematic review aims to explore the level of knowledge and attitude toward diabetes mellitus among the Saudi Arabian community, including healthcare professionals.

Materials and Methods

This systemic review of the literature was performed using the PubMed database in the duration between 2009 and 2019, to evaluate the level of knowledge and attitude toward type 2 diabetes mellitus in the adult Saudi population. Search included terms, such as Knowledge, Diabetes, and Saudi Arabia.

The title of all the articles, as well as abstracts resulting from this search, was reviewed accurately. After that, the results were filtered to include only original research articles investigating the level of knowledge or behavior of the Saudi community toward diabetes mellitus and its complications. Moreover, the selected trials mentioned the target population recruited in the qualitative study as well as the type of complication discussed. Only trials published in the English language were categorized as relevant studies which can be further assessed in the next step.

The following stage was planning the inclusion criteria to select the studies that will be considered in the systematic review. Abstracts were revised manually to select the appropriate abstracts to be considered. The inclusion criteria included mentioning of the target population and the type of diabetes complication. Moreover, only trials recruiting adult participants were included.

Furthermore, references of selected trials were checked to define any related articles. Finally, the identified data sets were obtained from the final record of eligible trials and summarized.

All the gathered data were statistically estimated as frequencies and valid percentages for categorical variables. Additionally, mean, standard deviations, minimum, and maximum were used to describe the numerical variable. Also, all statistical analyses were done using computer program IBM SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, NY) version 21 for Microsoft Windows.

Results

A total of 92 articles were retrieved by searching PubMed using the combination of the three terms, including knowledge, diabetes, and Saudi Arabia. After excluding articles on animals and including only trials on humans, 40 studies appeared.

Following the examination of abstracts and checking for the eligibility criteria in identified potential abstracts, a total of eight articles were considered as eligible to be included in the present systematic review that was published between 2009 and 2019 covering a whole of 3,927 responses from the Saudi community about the complications of diabetes.

Out of the 3,927 responders, 975 responders were diabetic patients. Two hundred twenty-two participants were physicians, 2,023 participants were from the general population, and 706 were university students; out of them, 96 responders were medical students.

Turning to study design, all the studies [14–21] were qualitative studies with a cross-sectional design. Three studies [14,16,19] recruited diabetic patients, two studies [15,21] recruited physicians, two studies [18,20] recruited university students, while only one study [17] recruited patients from the general population, which had the most significant sample size compared to all other included studies.

Based on the extracted data, all the trials considered the evaluation of the level of knowledge and behavior of Saudi society toward type two diabetes mellitus and its complications. The included trials are explained in details in Table 1.

Discussion

Diabetes is one of the leading chronic diseases globally. Incidence of diabetes mellitus is increasing and is thought to be doubled by 2030, especially in Asia and the Middle East region [5]. Poor control of diabetes can result in many micro-vascular and macro-vascular diabetic complications [8]. One of the primary reasons behind poor diabetes control is the level of knowledge and behavior of patients, caregivers, as well as physicians toward diabetes complications and significance of proper control of blood glucose level [11].

The present systematic review aimed to review the medical literature to explore the level of knowledge and behavior of the Saudi society, including diabetes patients, the general public, healthcare providers, toward the complications of diabetes.
### Table 1. Included trials.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Study design</th>
<th>Sample size</th>
<th>Target population</th>
<th>Type of complication</th>
<th>Objective</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Badedi et al. [14]</td>
<td>2016</td>
<td>Cross-sectional</td>
<td>288</td>
<td>Diabetic patients</td>
<td>Poor glycemic control</td>
<td>To assess factors associated with glycemic control among Saudi patients with Type 2 diabetes mellitus (T2DM).</td>
<td>Most of the T2DM patients had poor glycemic control. The study identified several factors correlated with glycemic control. Effective and tailored interventions are needed to mitigate exposure to these risk factors. This would improve glycemic control and reduce the risks inherent to diabetes complications. Lack of education, polypharmacy, and duration of diabetes was significantly associated with higher glycated hemoglobin (HbA1c).</td>
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<tr>
<td>Alzaidi et al. [15]</td>
<td>2016</td>
<td>Cross-sectional</td>
<td>101</td>
<td>Physician</td>
<td>Screening, detection, and prevention of diabetic complications.</td>
<td>To assess the knowledge, attitude, and practices toward diabetes and its complications among physicians in Taif.</td>
<td>The study revealed a good to an excellent awareness of Taif practitioners about early diagnosis, and management of diabetic complications, especially those practicing in tertiary hospitals, reflecting the values of continuous medical education programs applied in such hospitals.</td>
</tr>
<tr>
<td>Al-Aboudi et al. [16]</td>
<td>2016</td>
<td>Cross-sectional</td>
<td>75</td>
<td>Diabetic Patients</td>
<td>Microvascular and macrovascular complications</td>
<td>To investigate the association between knowledge and attitude with health-related quality of life (HRQoL) and complications of diabetes among patients with type 2 diabetes mellitus in Riyadh, Saudi Arabia</td>
<td>HRQoL and knowledge scores were moderate in type 2 diabetic patients in Riyadh, Saudi Arabia. Patient attitude toward the disease was positive, and this was positively associated with HRQoL; most respondents believed they are responsible for their care and getting complications.</td>
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<tr>
<td>Bani et al. [17]</td>
<td>2015</td>
<td>An observational, cross-sectional survey</td>
<td>2023</td>
<td>General population</td>
<td>Risk factors for diabetes and its complications</td>
<td>To estimate the prevalence, risk factors of diabetes complications among the adult population of the Jazan region, Saudi Arabia</td>
<td>Body mass index, age, family history of diabetes and daily exercise and work involved physical activities that showed a significant association with diabetes complications.</td>
</tr>
<tr>
<td>Baig et al. [18]</td>
<td>2015</td>
<td>Cross-sectional</td>
<td>610</td>
<td>University students</td>
<td>Cardiovascular complications</td>
<td>Knowledge and attitude toward risk factors of cardiovascular complications due to diabetes in Jeddah, Saudi Arabia</td>
<td>A considerable gap exists in the knowledge, attitude, and practice regarding risk factors of cardiovascular complications with diabetes among university students.</td>
</tr>
<tr>
<td>Ismail et al. [19]</td>
<td>2013</td>
<td>Cross-sectional</td>
<td>612</td>
<td>Diabetic patients</td>
<td>Oral complications</td>
<td>To evaluate the knowledge and awareness of diabetic patients toward their risk for oral diseases as complications associated with diabetes, and to evaluate their attitudes and practices toward sustaining good oral health.</td>
<td>The level of awareness and knowledge on dental health in diabetic patients was very poor. Most diabetic patients knew about various medical complications of diabetes and the effect of diabetes on body systems. About the attitude and practice of diabetic patients toward dental health, oral hygiene measures in diabetic patients were found to be good.</td>
</tr>
</tbody>
</table>
It is revealed from this review that the level of knowledge varied between different target groups and different areas in Saudi Arabia. Physicians in Taif showed a good level of knowledge regarding detection and management of diabetes complications as demonstrated by Alzaidi et al. [15], with a good to an excellent level of knowledge. On the other hand, in another study by Khan et al. [21], in Al Hasa district, it was shown that the level of knowledge of physicians in rural areas was better than physicians in urban areas, and that male physicians scored better than females [21].

Knowledge of university students toward diabetes complications was also evaluated. Baig et al. [18] recruited 610 university students to explore the knowledge of these students toward cardiovascular complications of diabetes in Saudi Arabia.

Baig et al. [18] revealed that the level of knowledge of university students was deficient as well as their behavior toward the same issue. Similarly, AlWadaani et al. [20] evaluated the knowledge and attitude of last year medical students toward diabetic retinopathy as one of the complications of diabetes. AlWadaani et al. [20] showed that the level of knowledge of medical students was also low. However, males scored better than females in knowledge questions while females scored better than males in attitude sections.

Turning to the public, Badedi et al. [14], Al-aboudi et al. [16], and Ismaeil et al. [19] investigated the knowledge and behavior of diabetic patients in different settings. In the three studies [14,16,19], level of knowledge of patients toward the significance of controlling their blood glucose levels and modifying their lifestyle to decrease the incidence of diabetes complications was very poor. Additionally, most of the patients agreed that their level of knowledge could affect their diabetes care and the severity of complication they might get from the disease [14,16,19].

The largest study evaluating knowledge and practices toward diabetes complications was conducted by Bani et al. [17] which included 2,023 participants from the general population to assess their understanding of the risk factors for getting diabetes complications. Bani et al. [17] revealed that the Saudi community had a good level of knowledge about risk factors for diabetes complications. The study [17] also showed that the most common risk factors were increased body mass index, positive family history of diabetes, lack of physical activity, and advanced age.

However, most of the included studies were performed in one center, which may decrease the validity of outcomes. Also, the sample size is considered small, with a total sample size of 3,927 participants. These limitations should be considered in future studies.

### Table 1. (Continued).

<table>
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<th>Author(s)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Al-Wadaani et al. [20]</td>
<td>2012</td>
<td>Cross-sectional survey</td>
<td>96</td>
<td>6th year of MBBS</td>
<td>Diabetic retinopathy</td>
<td>To evaluate the knowledge attitude and practice of the final year, medical students of King Faisal University medical college toward diabetes and diabetic retinopathy.</td>
<td>The mean of overall score (±SD) for all the respondents were 64.75 ± 11.17 (Maximum 100). The male student scored better than females in the knowledge and practice category while the attitude score of a female student was significantly higher than the male students. The main weakness of knowledge was on the epidemiology of Diabetes Mellitus, the follow up of the diabetic patient for the screening of diabetic retinopathy and the relation of the duration of diabetes with the development and progression of diabetic retinopathy. Many students believed that diabetes complications are more prevalent among uneducated people.</td>
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<tr>
<td>Khan et al. [21]</td>
<td>2010</td>
<td>Cross-sectional survey</td>
<td>122</td>
<td>Physicians</td>
<td>Management of type two diabetes</td>
<td>To evaluate the level of knowledge, attitude, and practice of GP physicians on the management of type 2 diabetes</td>
<td>Male physicians had better scores than females. Rural physicians had higher scores than urban. Main weaknesses were in the epidemiology of diabetes and diagnosis criteria. Young physicians had a better level of knowledge compared to older physicians</td>
</tr>
</tbody>
</table>
Finally, to our knowledge, this is considered the first systematic review in Saudi Arabia to show the level of knowledge and behavior of Saudi society on diabetes complications.

**Conclusion**

Data on the level of knowledge toward diabetes complications are conflicting; further large, multicenter studies should be considered to get an accurate estimation of knowledge and practices toward diabetes complications. Additionally, diabetes educators in hospital should increase awareness campaigns for diabetic patients and caregivers about the importance of diabetes control and dealing with diabetes complications in order to decrease morbidity.

**List of Abbreviation**

HRQoL Health-related quality of life

**Conflict of interest**

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**Author details**

1. Assistant Professor of Adult Nephrology, College of Medicine, Taif University, Taif, Saudi Arabia
2. Family Medicine, Taif University, Taif, Saudi Arabia

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