The Epidemiologic Profile of Diabetes Mellitus among Attendees of Outpatient Clinics at Bahrain Defense Force Hospital: A Cross-Sectional Study

Adri-Anna Aloia* and Ghufran Jassim
Royal College of Surgeons in Ireland Medical University of Bahrain, P.O. Box 15503, Adliya, Bahrain

Abstract

Background: Despite the worldwide epidemiology of Diabetes Mellitus and its global burden, scarce data is available from Bahrain.

Methods: This study is a descriptive analysis of data collected from 1613 patients attending an outpatient clinic at Bahrain Defense Force Royal Medical Service Hospital. Data was organized and analyzed using SPSS statistical package. The analysis was based on the American Diabetes Association’s guidelines.

Results: The Mean (±SD) Fasting Blood Sugar (FBS) for all candidates was 7.41 mmol/L (± 3.437) with a median of 6.23 mmol/L and a range of 27 mmol/L (3 mmol/L to 29 mmol/L). The prevalence of abnormal fasting glucose in the sample is 38.3%. FBS readings showed a significant increase in trend between age categories, with the exception of patients 80 years old and above. However, FBS reading was insignificant among gender categories.

Conclusion: This data gives specific insight towards program and management development for Bahrain.

Key words: Diabetes Mellitus Type 2, Diabetes, Bahrain, Middle East, Gulf, Fasting Blood Sugar, FBS, Epidemiology, International Diabetes Federation, IDF

Background

Diabetes mellitus is “a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both” [1,2]. Diabetes, in 2013, was found to have a prevalence of 8.3% globally affecting 382 million people around the world [3,4]. According to the World Health Organization’s estimate, the 2.8% prevalence of diabetes in 2000 was to double to 4.4% by 2030 [3,4]. However, with 2013 showing a drastic increase in comparison to previously estimated rates, diabetes is often described as a global epidemic disease [5]. Of the top 35 countries, as per the International Diabetes Federation’s (IDF), 8 were Arabic speaking countries in 2013 and 9 were Arabic speaking countries in 2014 [6,7]. In comparing the years, Bahrain was 12th and 11th for 2013 and 2014 respectively, marking itself as the 4th and 3rd of the Arabic speaking countries for the respective years [6,7]. Saudi Arabia and Kuwait remain to be the top two Arabic speaking countries, ranking among the top 10 countries worldwide [6,7].

Specifically in Bahrain, and according to the International Diabetes Federation, diabetes presents itself as a direct cause of 706 deaths for individuals between the ages of 20 and 79 years [7]. These results, are thought to be underestimated due to the lack of conclusive data related to death details [7,8]. Furthermore, the data suggested a national prevalence of 17.3% for diabetes mellitus in 2013 with estimated impaired glucose tolerance of 14.3% [7]. As the prevalence of diabetes rose to 21.9% in 2014, according to IDF, an estimate of 68600 people are undiagnosed, contributing to approximately 5.28% of data for the population of that year [7].

In 2013, with a diabetes prevalence of 21.8%, Bahrain was ranked 4th most prevalent of the Arabic speaking countries and 12th most prevalent worldwide [7]. These standings rose again in 2014, with a prevalence of 21.9%, Bahrain presented itself as the 3rd most prevalent of the Arabic speaking countries and 11th most prevalent worldwide [7].
Any of the following tests can be used to diagnose diabetes: A1C also called hemoglobin A1540000r HbA1c, fasting plasma glucose (FPG) and oral glucose tolerance test (OGTT) [9-11]. Visualization of HbA1c values and guidelines are typically used for assessment of type 2 diabetes and pre-diabetic incidence, preferably [9,11]. Other methods of diagnosis include the review of Impaired Fasting Glucose (IFG) and Impaired Glucose Tolerance (IGT), which represent abnormal glucose regulation by the body and are defined by elevated FPG concentrations or elevated glucose concentrations in OGTTs with normal FPG concentrations, respectively [12,13]. It is important to note that by assessment, IFG and IGT are not to define the same diabetic patient and thus may present themselves as separate cases. As outlined in Table 1, the various definitions of normal, impaired and abnormal blood glucose are quantitatively categorized. Usually, assessment using FBS, Abnormal Glucose Tolerance (AGT) readings confirm a patient as being diabetic, with pre-diabetic patients falling within IFG range.

The lack of published data in analyzing diabetes prevalence in Bahrain calls for a significant amount of research to be explored. The last research on incidence of diabetes in Bahrain was conducted in 2013 regarding gestational diabetes over the prior eight years [17]. It is noted that certain outreach groups, when studying diabetes prevalence in various countries worldwide, use various cutoffs and standards. For consistency and comparison purposes we will use the American Diabetes Association’s standards and cut off points, which IDF proposes to follow, in viewing this research data, as outlined in Table 1.

The objective of this study is to describe the prevalence of diabetes in an outpatient clinic at the Bahrain Defence Force Royal Medical Services Hospital (BDF). The nature of demographics in the Bahrain Defence Force Royal Medical Service Hospital includes military officials and their families. As all individuals contributing to the Bahraini forces are required to be Bahraini nationals, this allows our study to focus on the true Bahraini population. The retrieved information will provide insight to the health status of military officials, allowing health and nutrition policies to be taken into consider for review and improvising for better future care of military personnel and their families. This will have huge implications in combating the increasing the prevalence of obesity and sedentary life style in Bahrain.

This study aims to give a clearer insight into the epidemic diabetes presents itself in a sub population in the community. With this insight, plans for budgeting for treatment and health strategies may be implemented to support an individual with diabetes or work to lessen the prevalence of diabetes among the group. In addition, since BDF serves primarily Bahraini residents, this will take into account the potential cultural differences such as eating habits and sedentary lifestyles that may predispose an individual to develop diabetes.

**Methods**

This is a descriptive cross sectional survey in which the medical records of a random sample of 1613 patients from the Endocrinology clinic in BDF hospital were reviewed. Data was organized and collected for descriptive analysis. The differences in FBS (independent variable) among categorical sociodemographic variables (dependent variables) was tested using T-Test (for 2 categorical variables) or ANOVA (for more than 2 categorical variables). P value of ≤0.05 was considered significant. Age categories were organized as follows:

- Age category 1: 0-20 years of age
- Age category 2: 20-40 years of age
- Age category 3: 40-60 years of age
- Age category 4: 60-80 years of age
- Age category 5: 80+ years of age

**Results**

**Sociodemographic characteristics of participants**

The data was collected for 1613 patients. Table 2 shows the Sociodemographic characteristics of participants and their FBS data. The mean age (±SD) for patients was 52.84 (±15.99) with

<table>
<thead>
<tr>
<th>Sociodemographic Characteristic</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Mean (SD))</td>
<td>52.84 (±15.99)</td>
</tr>
<tr>
<td>Gender (Male and Female)</td>
<td>501 (31%) and 1112 (69%)</td>
</tr>
<tr>
<td>AgeCat 1 (No and %)</td>
<td>61 (3.78%) and 35 (57%)</td>
</tr>
<tr>
<td>AgeCat 2 (No and %)</td>
<td>280 (17.36%) and 55 (20%)</td>
</tr>
<tr>
<td>AgeCat 3 (No and %)</td>
<td>751 (46.56%) and 227 (30%)</td>
</tr>
<tr>
<td>AgeCat 4 (No and %)</td>
<td>487 (30.19%) and 170 (35%)</td>
</tr>
<tr>
<td>AgeCat 5 (No and %)</td>
<td>34 (2.11%) and 14 (41%)</td>
</tr>
</tbody>
</table>

- AgeCat 1: 0-20 years of age
- AgeCat 2: 20-40 years of age
- AgeCat 3: 40-60 years of age
- AgeCat 4: 60-80 years of age
- AgeCat 5: 80+ years of age

Table 2: Sociodemographic characteristics of participants and their FBS data (N=1613).
a median of 54 and a range of 87 years. About two third of the sample was female (68.94%). Most participants were in the age group 40-60 years and the least were in the age group 0-20, being approximately 46.6% and 3.8% of data, respectively.

Analysis of FBS

The mean (±SD) FBS for the sample was 7.41mmol/L (±3.47) with a median of 6.23mmol/L and a range of 27 mmol/L (3mmol/L to 29mmol/L). The prevalence of abnormal fasting glucose in the sample is 38.3%.

Higher FBS was seen among women at 7.42mmol/L (3.55), while men showed a mean FBS reading of 7.39mmol/L (3.18). With out regarding gender, the highest FBS was reported in the age group 60-80 years and the lowest in the age category 0-20, (7.79mmol/L and 5.698mmol/L respectively) as shown in Table 3.

Table 4 presents FBS cut offs and statistics per age category, while Table 5 compares significant FBS mean values to age categories and genders.

Discussion

This is a cross sectional study, which analyzed 1613 patients, ranged from 14 years to 101 years of age, and demonstrating an average FBS reading of 7.41mmol/L. The results of this study indicate that there has been an extremely rapid rise in the proportion of adults who meet the criteria for diabetes. The data observed a prevalence of 38.3% of participants studied to have diabetes. This is very much in line with the national figures for diabetes prevalence in the general population which calculated a crude prevalence of 30% [18] in the single population based study conducted in 1998 on 2128 native residents of Bahrain in 1995. However, when comparing our value to the value reported by IDF in 2014 (21.9%), a difference of 16.4% was observed [7]. This may be due to selection bias as the data sample has been collected from only one hospital in Bahrain, being localized to a selective community and participants were attending endocrine clinic the patients of which are mostly presenting with endocrine problems including diabetes itself. However, this value might also be underestimated as the current glycemic status of those patients might simply represent diabetes control because some of them have already been diagnosed with diabetes and are under treatment [7].

In studying the association between fasting blood sugar and sociodemographic factors of participants, gender was not found a significant factor; however age was. As age increases, average FBS readings significantly increased. This is expected and in line with published literature [18,19].

The observed female dominancy in attending the clinic potentially suggests better diagnosis and management of female cases, although not confirmed or analyzed by the above study.

To attribute to the increased FBS in later age categories, patients may suffer from desensitized beta cells as a result of chronic intake of por, sugary diets as well as lack of exercise being limited in their ability for physical activity. Within the Arab community, it is common for individuals to prefer driving shorter distances rather than walk and that few engage in labor trades. Such habits, although social markers of economic wellbeing, are not contributing positively along with diet choice in combating diabetes prevalence. Gender was not significant.

Strengths of this study includes that this is an updated, current assessment of the prevalence of diabetes within the Bahraini community, which has been lacking since the data collected in 1995. Additionally, the data was able to be compared to IDF presented values, using similar cut off points. The analysis of various age categories, allows health care providers within Bahrain to become more sensitive towards the highest risk groups, further allowing room for more specific research questions.

A limitation to this study is selection bias as the sample was selected solely from Bahrain Defence Force Royal Medical Service Hospital, which serves military personnel and their families. Additionally, other measures including BMI, level of physical activity, details of diet composition, family history details,
living conditions, as well as other laboratory values, including HbA1c, were not obtained for further analysis and associations. Therefore, further data collection, of which will limit bias and include all major hospitals may present a more accurate estimate of national prevalence, which may then be compared to the updated IDF values again.

As suggested by Al-Mahroos and McKeige [18], assessment of physical activity details, including information on hours spent sitting at work or in front of the TV, would be useful in developing community campaigns. Additionally, telemedicine initiatives in promoting health research and education attainable at the community level would increase awareness as well as promote random blood glucose checks from self monitoring within households outside of the BDF community. Furthermore, focused studies regarding the elder population of 60 years or more, including living conditions and dietary details may provide useful information to be applied towards meal planning initiatives. Additional studies assessing prevalence of obesity and its association with diabetes in this part of the world is worth exploring.

Conclusions

The prevalence of diabetes of patients attending endocrine clinics at the Bahrain Defence Force Royal Medical Service Hospital was 38.3% in 2014. Gender did not show a significant role in diabetes development; however, age did with an increase in prevalence with increased age. Future research may include assessment of physical and dietary habits to apply various tactics for diabetes management and prevention socially within the Bahraini population.

Further from the potential impact in initiative planning and monitoring of Bahraini families, especially those associated with military personnel, this study allows for potential planning and intervention within the Gulf region, being comprised of local data analysis. With the aspect of specifying attending families of military personnel, consideration for special resource and service provisions may be considered as preventative action within the Arabic speaking community.

List of Abbreviations

A1C: Glycated Hemoglobin
AGT: Abnormal Glucose Tolerance
ANOVA: Analysis Of Variance
BDF: Bahrain Defence Force Royal Medical Service Hospital
BMI: Body Mass Index
DM: Diabetes Mellitus
FBS: Fasting Blood Sugar
FPG: Fasting Plasma Glucose
HbA1C: Glycated Hemoglobin
IDF: International Diabetes Federation
IFG: Impaired Fasting Glucose
IGT: Impaired Glucose Tolerance
NGT: Normal Glucose Tolerance
No.: Number of
OGTT: Oral Glucose Tolerance Test
SD: Standard Deviation
TV: Television
WHO: World Health Organization

Key Points

Significant Findings: The study found a prevalence of 38.3% within the Bahraini population, exceeding the recorded prevalence values observed by international representatives. The study found a significant correlation to age and not to gender.

What The Study Adds: The study discusses source of bias which may skew the true prevalence rates as well as focusing on additional measures and actions which are required for further data collection and disease prevention in Bahrain and the Middle East.

Acknowledgements

We would like to thank Dr. Yihya for contributing his data to this study.

Declarations

Ethics Approval and Consent to Participate: Ethics approval was waived as this is an audit project providing information for quality purposes.

Consent to Participate

Not applicable.

Consent for Publication

Not applicable.

Availability of Data and Materials

The authors would like to omit this section.

Competing Interests

The authors declare that they have no competing interests (financial or non-financial).

Funding

No funding.

Authors’ Contributions

First Author: Adri-Anna Aloia was responsible for data analysis and interpretation, background research, writing of the final manuscript and submission of the final manuscript.

Author: Dr. Jassim Ghufran organized the research proposal and approval, provided guidance in data analysis, editing of all manuscripts and guidance for publication submission.

References


