Awareness of Type 2 Diabetic Patients about the Importance of Exercise and Diet on Diabetes Type 2 in the Western Region of Saudi Arabia

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ABSTRACT
Background: Diabetes is becoming more prevalent in undeveloped countries, what is known about self-care practice is insignificant, like self-monitoring of blood glucose, balanced diet, Medication adherence, and exercise. For people newly diagnosed with type 2 diabetes, exercise is usually one of the first control measures recommended. These practices are considered as the basis of diabetes management.

Objective: The study goal is to assess the awareness of type 2 diabetic patients about the importance of exercise and diet on diabetes type 2.

Methods: A cross-sectional observational survey study was carried out in western Province, Saudi Arabia. A questionnaires were used to ask about the background information and patients’ demographics, self-monitoring of blood glucose, eating and drinking habits, exercise habits, and beliefs about the effectiveness of diet and exercise on blood glucose.

Results: A total of 568 type 2 of diabetic patients. The average age of the participants was 51.89 ± 12.82 years, 53.5% were females, 89.8% were educated, 81.2% were married, and 30.1% were from Jeddah city. 30.3% of patients did not practice healthy habits, and 43% did not exercise, even though 90% believed that exercise and diet had a positive impact on glucose level in the blood. Male patients showed considerably a higher percentage of those who continued to engage in unhealthy habits such as smoking, eating fast food, eating sugars, or drinking soft drinks.

Conclusion: A significant proportion of Saudi diabetic patients did not follow a healthy diet and exercise on a regular basis. Health policymakers should conduct effective health education sessions for diabetic patients on the importance of a healthy diet and exercise in diabetes management.

Keywords: Awareness, Diabetic, Exercise, Diet.

1. BACKGROUND

In developing countries where the diabetes is becoming more prevalent, what is known about self-care practice is insignificant, like self-monitoring of blood glucose, balanced diet, medication compliance and exercise (1). Exercise is usually considered one of the first control techniques recommended for newly diagnosed T2D patients (2). These practices are considered as the basis of diabetes management (1). Diabetes mellitus represents various chronic metabolic disorders characterized by hyperglycemia-induced by either impaired insulin function or secretion (3).

With a prevalence of 8.8%, diabetes mellitus constitutes a worldwide health issue. The frequency of the disease and its severity are expected to increase (4). T2D is the most popular type of diabetes mellitus, accounted for 90% of all cases of diabetes (4). Globally, diabetes mellitus represents the fifth leading cause of mortality (5); 14.5% of mortality among people aged 20 to 79 years caused by diabetes (6). Patients with elevated levels of blood glucose are more expected to develop mortality from alkauses and several cardiometabolic disorders (7). Despite signifi-
cant attempts to enhance diabetes care, diabetes mellitus is strongly linked to increased mortality and morbidity, and it is considered costly for the health system (8).

Epidemiological investigations recommend that high versus low physical activity is related to decreased relative diabetes chance by around 50% (9). A very low tendency was recorded for blood glucose self-monitoring regularly and physical exercise practice (5). In 2017, a research was carried on determining the role of lifestyle on diabetes. It was found that the reduced physical activity and the ingestion of unhealthy diet led to rising in the prevalence of T2D worldwide, especially in developing countries like India (10). In addition, a study was carried in 2010 on women who have diabetes in the Kingdom of Saudi Arabia (KSA) and found poor knowledge, attitude, and practice (KAP) toward DM (11). In 2013 a study was done in Riyadh city to evaluate the dietary behaviors of type 2 DM patients in the center of diabetes at the hospital of King Abdulaziz University, King Saud University. The study found that the dietary habits of study patients were inadequate (12). As diabetic patients are confronted with many from the middle east, a study was one in 2015 on the tendency of consuming simple sugar, and a low saturated fat diet was of a high degree. Omani patients with DM type 2 found satisfactory awareness and good habits except for regular exercise adherence (13). Challenges that may affect their blood glucose level. The main challenge reported in several studies was the imbalance between lifestyle modification and control of blood sugar (14).

2. OBJECTIVE

The study goal is to assess the awareness of type 2 diabetic patients about the importance of exercise and diet on diabetes type 2.

3. SUBJECTS AND METHODS

Study design

This cross-sectional, survey-based study was conducted among T2DM patients in western Province of Saudi Arabia (Taif, Makkah, Jeddah, Yanbu, and Medina) cities. From January 2020 to August 2021. The participants were included All patients diagnosed with T2DM. The inclusion criteria were all T2DM patients of both males, and females and all nationalities older than 18 years who agreed to fill the questionnaire. The exclusion criteria were non-diabetic patients, or patients with T1DM, patients with T2DM who live outside the western region of Saudi Arabia, patients younger than 18, and those who disagreed to participate. The participate were randomly selected.

Data collection

Data was gathered by a questionnaire. Data collection was done through a self-administrated questionnaire that included items about demographic data, self-monitoring of blood glucose, the habits of food and drinks, whether the patient is doing exercise or not, and patient’s beliefs about the effectiveness of diet and exercise on blood glucose. A pilot study of ten T2DM patients was conducted to testing the validation of the questionnaire which revealed that it is convenient to achieve the objective of the study. All patients included in the pilot study were excluded from data analysis.

Statistical analyses and sample size calculation

The Chi-squared test was used to examine the association between variables, and qualitative data were reported as numbers and percentages. Non-parametric variables were tested using Mann-Whitney and Kruskal Wallis tests, and quantitative results were reported as mean and standard deviation (mean SD). Correlation analysis using Spearman’s test was done, and a p-value of <0.05 was considered statistically significant. Considering a confidence level of 95%, a marginal error of 5%. A total of 568 eligible participants responded to the questionnaire was done were included in the statistical analysis.

Ethical considerations

All participants written consents from their parents and willing to be interviewed and examined to see if they accept to participate in the study or not. Only those who agreed to participate were included. The Research Ethics Committee of Taif University in Saudi Arabia gave their consent before any study-related procedures were carried out.

4. RESULTS

The total number of type 2 diabetic patients were 568. The participants’ average age was 51.89 ± 12.82 years, 55.3% were females, 89.8% were educated, 81.2% were married and 30.1% were from Jeddah city. The mean DM duration among the participants was 9.59 ± 8.44 years, 55.1% evaluated their health as good, 46% of the participants were measuring their sugar levels in the home but not always.

| Variable | No. (%)
|----------|--------|
| Age in years (mean ± SD) | 51.89 ± 12.82 |
| Gender | |
| Male | 264 (46.4) |
| Female | 304 (53.5) |
| Education | |
| Educated | 510 (89.8) |
| Undeducated | 58 (10.2) |
| Social status | |
| Single | 27 (4.8) |
| Married | 461 (81.2) |
| Divorced | 32 (5.6) |
| Widow | 48 (8.5) |
| City | |
| Makkah | 113 (19.9) |
| Jeddah | 171 (30.1) |
| Yanbu | 78 (13.7) |
| Medina | 88 (15.5) |
| Taif | 118 (20.8) |
| Diabetes duration (years) (mean ± SD) | 9.59 ± 8.44 |

In general, how do you evaluate your health?

Excellent | 120 (21.1) |
Good | 313 (55.1) |
Acceptable | 117 (20.6) |
Bad | 18 (3.2) |

Do you measure your blood sugar at home?

Yes, constantly | 253 (44.5) |
Yes, but not always | 261 (46) |
No | 54 (9.5) |

Do you follow a special diet to control the level of blood sugar?

Yes | 251 (44.2) |
No | 317 (55.8) |

Do you exercise? (Such as: walking, jogging, jumping, swimming, etc.)

Yes | 324 (57) |
No | 244 (43) |

If yes, how many days are you exercising each week?

Five days | 73 (12.9) |
Less than five days | 206 (36.3) |
more than five days | 45 (7.9) |

I don't play sport | 244 (43) |

Table 1. Distribution of the studied participants according to their characters, diabetes duration, their health evaluation, frequency of blood sugar measurement, following a special diet and exercise practice (no.: 568)
About 44.2% were following a special diet to keep their blood sugar under control, 57% were practicing exercises, 36.3% were practicing it for less than five days per week and 22.5% were practicing it for thirty minutes (Table 1).

The table depicts that 22.9% of the participants were eating sugars, while 30.3% reported not following any unhealthy habits “smoking, eat fast foods, eat sugars or drinking soft drinks”. Only 4% were practicing unhealthy habits with a mean number of practiced habits of 1.23 ± 1.14. of those who practiced these habits, 18.8% reported that they practice them oftentimes (Table 2).

According to what is shown in the figure, 90% of the participants thought exercise and diet positively impact the blood sugar level (Figure 1). The percentage of male patients was higher of those who were repeating the unhealthy habits “smoking, eat fast foods, eat sugars or drinking soft drinks” (p<0.05). Elseways, a non-significant difference was found between gender and health evaluation, frequency of blood glucose measurement, following a special diet to control blood glucose, exercise practice, practicing unhealthy habits and the belief whether exercise and diet have a positive affect on the level of blood sugar (p=>0.05) (Table 3).

Table 4 illustrates that educated participants had a significantly longer mean diabetic duration (p<0.05) (Table 6). According to what is shown in the table, 90% of the participants thought exercise and diet positively impact the blood sugar level (Figure 1). The percentage of male patients was higher of those who were repeating the unhealthy habits “smoking, eat fast foods, eat sugars or drinking soft drinks” (p<0.05). Elseways, a non-significant difference was found between gender and health evaluation, frequency of blood glucose measurement, following a special diet to control blood glucose, exercise practice, practicing unhealthy habits and the belief whether exercise and diet have a positive affect on the level of blood sugar (p=>0.05) (Table 3).

| Variable | Male No. (%) | Female No. (%) | χ² | p-value |
|----------|--------------|----------------|-----|---------|
| How often do you repeat the previous habits? | | | | |
| Always | 130 (56.2) | 77 (13.6) | 95.3 | <0.001 |
| Often | 178 (78.3) | 107 (18.8) | 70.2 | <0.001 |
| Sometimes | 52 (22) | 49 (40.8) | 0.28 | 0.60 |
| Rarely | 10 (5.6) | 10 (5.56) | 0.01 | 0.93 |
| I don’t do any of it | 124 (54) | 174 (30.6) | | |
| Number of done habits (mean ± SD) | 1.15 ± 1.06 | 1.23 ± 1.14 | 0.87 | 0.36 |
| How often do you repeat the previous habits? | | | | |
| Always | 130 (56.2) | 77 (13.6) | 95.3 | <0.001 |
| Often | 178 (78.3) | 107 (18.8) | 70.2 | <0.001 |
| Sometimes | 52 (22) | 49 (40.8) | 0.28 | 0.60 |
| Rarely | 10 (5.6) | 10 (5.56) | 0.01 | 0.93 |
| I don’t do any of it | 124 (54) | 174 (30.6) | | |
| Number of done habits (mean ± SD) | 1.15 ± 1.06 | 1.23 ± 1.14 | 0.87 | 0.36 |

Table 3. Relationship between participants; gender and their health evaluation, frequency of blood sugar measurement, following a special diet, exercise practice, practicing unhealthy habits and frequency of this practice and their opinion if exercise and diet have a positive impact on blood sugar level (no.: 568)
It is clear from Figure 3 that a substantial negative association between DM length (years) and the number of unhealthy habits practiced ($r=−0.15$, $p$-value $<0.001$).

**5. DISCUSSION**

Discussion Diabetes is a major public health problems in Saudi Arabia. It raises the risk of a number of comorbidities. As a result, in order to address the significant problem of diabetes in KSA, community awareness must be raised (15) the aim of the present study was to assess the awareness and knowledge towards type 2 Diabetes Mellitus (T2DM). Type 2 diabetes now occurs in early age due to obesity and inactivity epidemic among the young population. Type 2 DM requires both insulin resistance and insufficient insulin secretion (16). The present study aimed to evaluate the awareness level of the importance of exercise and diet for Saudi patients with type 2 DM in the western region of KSA. The study found that 30.3% of patients did not have healthy habits. Previous studies found that high intake of lean meat, sweets, and fried foods contribute to the increased risk of insulin resistance and T2DM (17). While Physical activity may be most helpful in preventing the progression of type 2 diabetes at an early stage before insulin treatment is needed (17).

A considerable percent of the study patients (46%) was measuring their blood sugar at home but not always. It was observed that diabetic patients can benefit from self-care and good health habits to enhance their life quality (13). The successful management of diabetes requires patient adherence, education and incorporation into the healthcare team (18).

Of our patients, 57% were practicing exercises. According to Boule et al. moderate-intensity physical activity can reduce HbA1c by 0.6 percent on average in patients with type 2 DM (13). In comparison with previous studies, 38.7% 12.5% 12.7% 46.3% of studied diabetic patients were practicing exercise (13, 15, 19) number of subjects living with diabetes in Oman will rise from 75,000 in 2000 to 217,000 in 2025. It has been well established that data on KP of diabetic patients reveal aspects of education that need to be reinforced and addressed in order to improve diabetes management. Objective: The aim of this cross-sectional study was to assess the diabetes mellitus type 2 related knowledge and practices (KP).

![Figure 1. Percentage distribution of the participants according to if they think exercise and diet have a positive impact on your blood sugar level](image1)

**Figure 1. Percentage distribution of the participants according to if they think exercise and diet have a positive impact on your blood sugar level**

![Figure 2. Relationship between participants education and their opinion if exercise and diet have a positive impact on your blood sugar level, N.B.: ($X^2=77.07$, $p$-value $<0.001$)](image2)

![Figure 3. Spearman correlation between DM duration (years) and number of followed unhealthy habits](image3)

| Variable                      | Education                       | $\chi^2$ | $p$-value |
|-------------------------------|---------------------------------|----------|-----------|
| In general, how do you evaluate your health? | Educated No. (%) | Uneducated No. (%) | $\chi^2$ | $p$-value |
| Excellent                     | 115 (95.8)                     | 5 (4.2)  | 34.61     | $<0.001$ |
| Good                          | 291 (93.9)                     | 22 (7.1) | 25 (21.4) |          |
| Acceptable                    | 92 (78.6)                      | 25 (21.4) |          |          |
| Bad                           | 12 (66.7)                      | 6 (33.3) | 13 (24.1) |          |
| Do you measure your blood sugar at home? | Yes                           | 232 (91.7) | 21 (8.3) |          |
| No                            | 41 (75.9)                      | 13 (24.1) |          |          |
| Do you follow a special diet to control the level of blood sugar? | Yes                           | 220 (87.6) | 31 (12.4) |          |
| No                            | 290 (91.5)                     | 27 (8.5)  | 2.24      | 0.13     |
| Do you do exercise? (Such as: walking, jogging, jumping, swimming, etc.) | Yes                           | 303 (93.5) | 21 (6.5)  |          |
| No                            | 207 (84.8)                     | 37 (15.2) | 11.44     | $0.001$  |
| No of unhealthy habits (mean SD) | 1.24 ± 1.13                    | 1.1 ± 1.19 |          |          |
| How often do you repeat the previous habits? | Always                         | 68 (88.3)  | 9 (11.7)  |          |
| Often                         | 101 (94.4)                     | 6 (5.6)   | 8.84      | 0.144    |
| Sometimes                     | 160 (89.9)                     | 18 (10.1) |          |          |
| Rarely                        | 31 (96.9)                      | 1 (3.1)   |          |          |
| I don’t do any of it          | 150 (86.2)                     | 24 (13.8) |          |          |

Table 4. Relationship between participants education and their health evaluation, frequency of blood sugar measurement, following a special diet, exercise practice, practicing unhealthy habits and frequency of this practice and their opinion if exercise and diet have a positive impact on blood sugar level (no.: 568)
In this study, 90% of diabetic patients had a positive attitude, as they believed that a healthy diet and exercise have a positive impact on diabetes. This agrees with another study carried out in Arar city, KSA, where 86.3% of diabetics reported this positive attitude. While in comparison, only 65% of Indian diabetic patients were conscious of dietary factors and exercise on diabetes (19). This variation between our results and the Indian result could be because of the presence of high percent of educated participants in the present study. Participants of the present study who evaluated their health as bad (5.2%), who were not following a special diet (55.8%) and who were not practicing exercises (43%) had a significantly longer diabetes duration. We believe that the reason for this it could be because of the boredom of a long time of the disease as it was revealed that the misconception on diabetes severity, effectiveness of healthy lifestyle, and exercise timing was prevalent among diabetic patients and could be a barrier to healthy habits (21). In this work, it was discovered that 44.4% of males and 55.6% of females did not keep track of their blood glucose levels on their own at home to the low adherence to blood glucose self-monitoring practices was previously due to significant cost constraints to purchasing a glucometer (22). About 44% (44.2%) of this study participants were not adherent to special dietary management to keep their blood glucose under control.

This result is significantly lower than that revealed from a study done in Ethiopia, where 75.9% did not follow special dietary management. This difference could be attributed to the different socioeconomic status as Saudi Arabia generally is having a higher socioeconomic status than Ethiopia (20). This work observed that educated diabetic patients were significantly more prone to suffer from an excellent health evaluation, measuring their blood glucose levels are at home on a regular basis, exercise, and agree that exercise and diet have a positive effect on blood glucose levels. The same association between education, awareness and good practice among diabetic patients was revealed from a study done in Ethiopia, where 75.9% of females did not keep track of their blood sugar level (21).

6. CONCLUSION
Patients who were educated and married has a much higher proportion of having an excellent evaluation of their health, measuring their blood sugar at home on a regular basis, exercising and agreeing that exercise and diet have a positive impact on the levels of blood sugar.

Patients who rated their well-being as poor, did not follow a special diet to control blood glucose and did not exercise had a significantly longer mean diabetes duration.

A large proportion of Saudi diabetic patients did not follow a healthy diet or exercise on a regular basis. Health policymakers should hold effective health education sessions for diabetic patients to emphasize the importance of a healthy diet and exercise in diabetes management.

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| Variable | Single No. (%) | Married No. (%) | Divorced No. (%) | Widow No. (%) | $\chi^2$ | p-value |
|----------|----------------|-----------------|-----------------|--------------|-------|---------|
| Do you measure your blood sugar at home? | Yes | 12 (4.7) | 207 (81.8) | 22 (8.7) | 0.001 |
| No | 12 (4.8) | 218 (83.5) | 12 (4.7) | 22 (8.7) | 0.001 |

Table 5. Relationship between participants’ marital status and their health evaluation, frequency of blood sugar measurement, following special diet, exercise practice, practicing unhealthy habits and frequency of this practice and their opinion if exercise and diet have a positive impact on blood sugar level (no.: 568)
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