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Awareness and Practice of Diabetic Patients about Obesity in Saudi Arabia Cross-Sectional Stu*dy*

Abdulsalam Saud Alharbi[1], Abdulrahman K Alenezi[1], Abdulhakim Alqahtani[1], Mansour N Alsuliman[1], Moaath Fahad Alharbi[1], Talal Z Alruwaili[1], Meshari M Hader[2], Mohammed H Karrar Alsharif[3*]

[1]College of Medicine, Prince Sattam Bin Abdulaziz University, Al Kharj 11942, Saudi Arabia
[2]Nutrition Department, Lancare Clinics, Riyadh, 13213, Saudi Arabia
[3]Department of Basic Medical Science, College of Medicine, Prince Sattam Bin Abdulaziz University, Al Kharj, 11942, Saudi Arabia

ABSTRACT

Obesity is a serious public health issue linked to the occurrence of diabetes type 2. However, only a few studies have examined how type 2 diabetics (T2D) patients perceive obesity. In this study, we want to see how T2D patients in Saudi Arabia feel about obesity and what they do about it.

T2D patients were examined for their understanding of how obesity impacts their disease and worries. In addition to their habits, such as weight-loss activities and eating habits, in a cross-sectional study done in Saudi Arabia.

A total of 421 T2DM patients were included. A total of 234 (55.6%) were obese, and 187 (44.4%) were non-obese. Patients' ages ranged from 18 to 80 years, with a mean age of 40.2 ± 16.5 years old.

This research will aid public policymakers in developing a more effective evidence-based and informed communication strategy. As a result, adequate efforts must be made to raise awareness of obesity and its repercussions, and the availability of exact information is critical to such efforts' success.

Key words: Obesity, Awareness, Type 2 diabetes, Public health

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Corresponding author: Mohammed H. Karrar Alsharif

e-mail✉**:** dr.anatomy83@yahoo.com

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INTRODUCTION

Obesity and overweight are defined as an abnormal or excessive buildup of fat that can be damaging to one's health. The body mass index (BMI) is a basic weight-for-height metric that's frequently used to determine whether or not a person is overweight or obese. It is computed by multiplying a person's kilogram weight by his squared height (kg/m2) [1]. Obesity, like hypertension and atherosclerosis, is a chronic condition. Obesity is caused by an energy imbalance between the energy absorbed in food and the energy expended in physical activity [2]. Each disease with an increased risk due to obesity can be divided into one of two pathophysiological groups. An increase in fat mass causes the first group of disabilities. Obesity stigma and the behavioral responses it causes, osteoarthritis, and sleep apnea are among them—the dangers connected with metabolic alterations caused by excess fat fall under the second category. Diabetes mellitus, gallbladder disease, hypertension, cardiovascular disease, and several cancers linked to obesity are among them [2]. Type 2 diabetes is caused due to insensitivity of insulin receptors witch located on lipocytes (fat cells). Type 2 diabetes affects more than 95% of patients with diabetes. Fatness and poor physical are the primary causes of this type [3].

According to the World Health Organization (WHO), Saudi Arabia has the second-highest diabetes rate in the Middle East and ranks seventh globally. According to estimates, around 7 million people have diabetes, and almost 3 million have pre-diabetes [4]. Overweight people accounted for 36.9% of the population. In Saudi Arabia, men are significantly more likely than women to be overweight (42.4 percent *vs.* 31.8 percent) [5]. Patients with T2DM who lost weight had better control

of their hyperglycemia. Due to the importance of patient awareness and understanding of the management of obesity and T2DM, it is necessary to analyze patient attitudes and behaviors about obesity and related disorders [6]. All previous studies ensure the strong relationship between obesity and DM 2, which leads us to question further the knowledge and awareness of diabetic patients regarding obesity and its effect on their diabetes status. Lifestyle modifications such as losing weight and normalizing the patient's BMI can improve the condition and reduce mortality and morbidity. In this study, we aim to evaluate the awareness and knowledge of diabetic patients concerning Obesity.

AIM AND OBJECTIVES

Aim

Type 2 diabetes is one of the chronic diseases that Saudi society suffers from; the Saudi Ministry of Health carries out many periodic awareness and guidance campaigns throughout the year that contribute to raising the levels of knowledge and awareness about health practices for people with type 2 diabetes, and what is not There is no doubt that obesity is linked to many diseases, including type 2 diabetes patients, so this study is based on evaluating the level of obesity and the levels of knowledge and awareness health practices in patients with type 2 diabetes.

Objectives

- ✓ Assessment of the level of knowledge and the assessment of obesity in patients with type 2 diabetes.
- ✓ Knowing the level of obesity in patients with type 2 diabetes.
- ✓ Assessment of the knowledge of patients with type 2 diabetes onset of high blood pressure.
- ✓ Assessing the awareness of patients with type 2 diabetes on the correct practices to track their health.
- ✓ Knowing the unhealthy practices of type 2 diabetes patients.

METHODOLOGY

Study design, population and site

A quantitative cross-sectional study of 421 Diabetic patients. An electronic questionnaire was distrusted among patients with Type 2 diabetes mellitus in Saudi Arabia for both genders. The questionnaire was designed in English following a review of the published literature and consultation with experts and then was translated into Arabic. The questionnaire used in the previous study and well-structured and divided into four sections. The first part was about the personal information which included gender, age, educational level, medical illness status, weight & height . The second half focused on understanding obesity, appropriate body weight, BMI thresholds, and obesity risk factors and causes. The final segment examined the individuals' attitudes toward obesity and T2DM, as well as their willingness to reduce weight, change their diet, and exercise. The final portion enquired about their weight loss regimen (if any), eating habits, and weight, blood pressure, and blood glucose level measurements, among other things.

The study was conducted with type 2 diabetic patients between January and March 2022, asking about their behavior and practice regarding obesity. A research board review was obtained from the health and science disciplines research ethics committee at Prince Sattam bin Abdulaziz University (SCBR-06-2022). Consent was obtained from the participants in the survey.

Data collection

An electronic questioner distributed by social media to the Patient with type 2 diabetes. The questionnaire includes age, BMI, and questions about their lifestyle, exercise, and weight loss methods. It also includes questions if they have hypertension or not and how many times they measure their blood pressure and body weight. Also, we ask them about their knowledge of the relationship between obesity and diabetes and other diseases.

Data analysis

After the data was extracted, it was reviewed, coded, and fed into the IBM SPSS version 22 statistical program (SPSS, Inc. Chicago, IL). Two-tailed tests were used for all statistical analyses. A statistically significant P value was less than 0.05. All variables, including diabetic patients' socio-demographic and clinical data, were subjected to descriptive analysis based on frequency and percent distribution. Crosstabulation was used to compare obese and non-obese patients for all obesity-related factors, including awareness regarding obesity, patients' Behaviour, practice, and self-monitoring. Relations were tested using the Pearson chi-square test and exact probability test for small frequency distributions.

RESULTS

A total of 421 T2DM patients were included. A total of 234 (55.6%) were obese, and 187 (44.4%) were non-obese. Patients' ages ranged from 18 to 80 years, with a mean age of 40.2 ± 16.5 years old. The exact 69.8% of patients were males, and 53.2% had a university education. A total of 21.4% had hypertension, 20.7% were current smokers, while 72.4% were non-smokers. There was a significant difference between obese and non-obese patients regarding age, gender and education level (Table 1).

Table 2 shows awareness regarding obesity among T2DM patients, Saudi Arabia. The exact 38% of obese patients know the difference between obesity and overweight compared to 75.9% of non-obese patients (P=0.001). Also, 50.4% of obese patients know the normal blood

Table 1: Bio-demographic data of T2DM patients, Saudi Arabia.

Bio-demographic data	Obesity						p-value
	Total		Obese		Non-obese		
	No	%	No	%	No	%	
Age in years							
< 30	147	34.90%	52	22.20%	95	50.80%	0.001*
30-49	160	38.00%	112	47.90%	48	25.70%	
50+	114	27.10%	70	29.90%	44	23.50%	
Gender							
Male	294	69.80%	187	79.90%	107	57.20%	0.001*
Female	127	30.20%	47	20.10%	80	42.80%	
Educational level							
Below secondary	105	24.90%	76	32.50%	29	15.50%	0.001*
Secondary	92	21.90%	43	18.40%	49	26.20%	
University / above	224	53.20%	115	49.10%	109	58.30%	
Diagnosed with HTN							
Yes	90	21.40%	56	23.90%	34	18.20%	0.153
No	331	78.60%	178	76.10%	153	81.80%	
Smoking							
Current smoker	87	20.70%	42	17.90%	45	24.10%	0.109
Ex-smoker	29	6.90%	13	5.60%	16	8.60%	
Non-smoker	305	72.40%	179	76.50%	126	67.40%	
P: Pearson X2 test							
*P<0.05 (significant)							

Table 2: Awareness of fat and non-fat patients about obesity among type 2 diabetic patients, Saudi Arabia.

Awareness about obesity	Obesity				p-value
	Obese		Non-obese		
	No	%	No	%	
Obesity and overweight are different?					
Yes	89	38.00%	142	75.90%	0.001*
No	145	62.00%	45	24.10%	
Do you know the normal blood glucose level?					
Yes	118	50.40%	115	61.50%	.023*
No	116	49.60%	72	38.50%	
What is the normal blood glucose level?					
100-140	77	65.30%	79	68.70%	0.214
140-200	26	22.00%	16	13.90%	
70 -100	15	12.70%	20	17.40%	
Do you know the ideal body weight?					
Yes	67	28.60%	86	46.00%	0.001*
No	167	71.40%	101	54.00%	
What is the ideal body weight?					
<18.5	6	9.00%	4	4.70%	.215$
18.5-24.9	45	67.20%	72	83.70%	
25-29.9	9	13.40%	6	7.00%	
30-34.9	5	7.50%	3	3.50%	
>35	2	3.00%	1	1.20%	
Do you know how to measure body weight?					
Yes	62	26.50%	77	41.20%	0.001*
No	172	73.50%	110	58.80%	
If someone is obese, what could this obesity lead to?					
DM	146	62.40%	119	63.60%	0.001*
HTN	147	62.80%	66	35.30%	
CVD	84	35.90%	59	31.60%	
High cholesterol	113	48.30%	98	52.40%	
Joint pains/arthritis	68	29.10%	41	21.90%	
None of the above	21	9.00%	27	14.40%	

Which of the following lead to obesity ?					
Slow metabolism	66	28.20%	66	35.30%	
High-calorie intake	151	64.50%	137	73.30%	
Lack of exercise	164	70.10%	135	72.20%	0.009*
Family history	117	50.00%	82	43.90%	
Others	1	0.40%	8	4.30%	
P: Pearson X2 test					
$: Exact probability test					
* P<0.05 (significant)					

glucose level versus 61.5% of the non-obese group (P=.023). Knowing the ideal body weight was detected among 28.6% of the obese group compared to 46% of the non-obese group (P=0.001). Additionally, 26.5% of obese patients know how to measure body weight versus 41.2% of non-obese patients (P=0.001). As for risk factors of obesity, the most known among obese patients were hypertension (62.8%), followed by DM (62.4%) and high cholesterol levels. The most known for non-obese were DM (63.6%), followed by high cholesterol (52.4%), and HTN (35.3%). Considering causes of obesity, the most reported by obese patients were lack of exercise (70.1%) and high calories intake (64.5%) compared to 73.3% and 72.2% for non-obese, respectively; P=0.009.

Table 3 illustrated the Behaviour of fat & non-fat diabetic patients about obesity, Saudi Arabia. A total of 59% of obese patients are willing to reduce weight compared to 50.3% of non-obese while 36.9% of non-obese think there is no need versus 4.7% of obese patients (P=0.001). The most reported reason for weight reduction among obese was to avoid further complications (84.1%) versus 78.7% for non-obese patients. Also, 62.4% of obese patients need to consult a physician to reduce weight versus 46% of the non-obese group (P=0.001). About 16.2% of obese patients think that Diabetes and obesity are not related versus 5.9% of the non-obese group (P=0.001). Additionally, 97.9% of obese patients believe having the appropriate awareness of their illness and management can land them over a controllable state compared to 90.4% of the non-obese group (P=0.001).

Table 4 shows behaviors of fat and non-fat diabetic patients about obesity, Saudi Arabia. A total of 83.4% of obese patients reported previous trials to reduce weight compared to 67.9% of non-obese patients (p=0.001). The most applied options among obese patients were exercise (81%) versus 72.4% for non-obese then following a dietary system (77.4% vs. 64.6%, respectively; P=0.001). Exercises were daily among 11.4% of obese patients compared to 23.9% of non-obese (P=0.009). About 88.7% of obese patients tried dietary systems to reduce weight versus 82.7% of non-obese.

Table 5 explains Self-assessment behaviors of fat and non-fat diabetic patients, Saudi Arabia. A total of 50% of obese patients checked their blood pressure compared to 33.2% of non-obese patients (0.001). Additionally, 64.5% of obese patients checked their blood glucose levels versus 41.6% of the non-obese group (P=0.001). Furthermore, about 71.1% of the obese patients checked their weight versus 74.9% of non-obese patients, which was weekly among 40.2% of the obese group versus 19.8% of non-obese (P=0.001).

The Figure 1 shows that 67.4% of participants with a secondary level of education showed willing to reduce their weight compared to 58.9% of those with a university level of education and 36.2% of others with below secondary level of education with recorded statistical significance (P=0.001).

The Figure 2 shows that 65.4% of female participants showed willing to reduce their weight compared to 50.7% of male participants with recorded statistical significance (P=0.001).

The Figure 3 shows that 41.5% of young aged participants (< 30 years) checked their weight monthly, while 47.5% of those aged 30-49 years checked their weight weekly and 43.9% of old aged patients (50 years / more) never checked their weight with recorded statistical significance (P=0.001).

The Figure 4 shows that 23.3% of female participants practice exercise daily while 76.7% do it a few times a week compared to 13.7% and 86.3% of male participants, respectively, with no statistical significance (P=.076).

DISCUSSION

Recently, obesity has been a challenging public health problem worldwide due to its association with diabetes, hypertension and other health problems linked to metabolic syndrome. (1) Obesity trend in developing countries is upward to changes in lifestyle with more urbanization, which affects all public issues with a higher risk of the diseases related to overweight and obesity [2,3]. Type 2 diabetes and obesity are associated with insulin resistance as a majority of obese persons, despite having insulin resistance [4].

The WHO reported that Kuwait, Bahrain, Saudi Arabia, and UAE are today among the highest ten countries internationally regarding obesity prevalence. In Saudi Arabia, the obesity prevalence is 35.2% [5]. Similarly, in the UAE, obesity prevalence among school children was estimated to be 16.9% among females compared to 16.5% among males [6].

Table 3: The behaviors of fat and non-fat patients about obesity among type 2 diabetic patients, Saudi Arabia.

Behaviour	Obesity				p-value
	Obese		Non-obese		
	No	%	No	%	
Would you lose weight?					
Yes	138	59.00%	94	50.30%	0.001*
No	85	36.30%	24	12.80%	
No need	11	4.70%	69	36.90%	
If yes, then choose one or more of the following motives					
Social/relatives' pressure	34	24.60%	17	18.10%	0.413
Avoid further complications	116	84.10%	74	78.70%	
To do daily work more efficiently	53	38.40%	39	41.50%	
To fit my social environment	66	47.80%	52	55.30%	
Would you talk to a doctor to lose your weight?					
Yes	146	62.40%	86	46.00%	0.001*$
No	88	37.60%	101	54.00%	
Do you believe the overweight person should reduce his/her weight?					
Yes	223	95.30%	172	92.00%	0.16
No	11	4.70%	15	8.00%	
In your opinion, is it important for the diabetic patient to reduce his/her weight?					
Very Important	189	80.80%	159	85.00%	0.001*
No need to lose weight	7	3.00%	17	9.10%	
Diabetes and obesity are not related	38	16.20%	11	5.90%	
Do you believe having appropriate awareness of your disease can land you in a controllable state?					
Yes	229	97.90%	169	90.40%	0.001*$
No	5	2.10%	18	9.60%	
P: Pearson X2 test					
$: Exact probability test					
* P<0.05 (significant)					

Table 4: Behaviors of fat and non-fat diabetic patients about obesity, Saudi Arabia.

Practice	Obesity				p-value
	Obese		Non-obese		
	No	%	No	%	
Did you try to reduce your weight?					
Yes, often	112	47.90%	67	35.80%	0.001*
Yes, occasionally	83	35.50%	60	32.10%	
Never tried	31	13.20%	19	10.20%	
No need	8	3.40%	41	21.90%	
If yes, which of the following choices have you tried to lose weight?					
Gym exercises	158	81.00%	92	72.40%	0.001*
Weight-reducing medication	87	44.60%	25	19.70%	
Avoiding meals	113	57.90%	49	38.60%	
Dietary system	151	77.40%	82	64.60%	
If you said yes to gym exercise, how often do you exercise?					
always	18	11.40%	22	23.90%	0.009*
sometimes	140	88.60%	70	76.10%	
Did you try a diet/regime to lose weight?					
Yes	173	88.70%	105	82.70%	0.123
No	22	11.30%	22	17.30%	
P: Pearson X2 test					
* P<0.05 (significant)					

The current study aimed to assess the behaviors of type 2 diabetic patients regarding obesity in Saudi Arabia. The study results showed that non-obese patients were in the young age group (<30 years) with high education levels. The vast majority of obese patients (more than three-quarters) were males. As for patients' awareness regarding obesity, non-obese patients were more aware regarding the difference between overweight and obesity than obese patients. Also, many non-obese patients know the normal blood glucose level, the ideal body weight, and the know-how to measure body weight. These findings were consistent with Saleh F

Table 5: Self-assessment behaviors of fat and non-fat diabetic patients, Saudi Arabia.

Self-assessment	Obesity				p-value
	Obese		Non-obese		
	No	%	No	%	
I check my blood pressure….?					
always	9	3.80%	11	5.90%	0.001*
Many times / week	48	20.50%	23	12.30%	
2 times / week	41	17.50%	7	3.70%	
1 time / week	19	8.10%	21	11.20%	
Never	117	50.00%	125	66.80%	
I check my blood glucose level….?					
always	31	13.20%	36	19.30%	0.001*
Many times / week	48	20.50%	20	10.70%	
2 times / week	52	22.20%	13	7.00%	
1 time / week	20	8.50%	7	3.70%	
Never	83	35.50%	111	59.40%	
I check my weight ….?					
always	11	4.70%	16	8.60%	0.001*
Weekly	94	40.20%	37	19.80%	
Monthly	59	25.20%	87	46.50%	
Never	70	29.90%	47	25.10%	
P: Pearson X2 test					
* P < 0.05 (significant)					

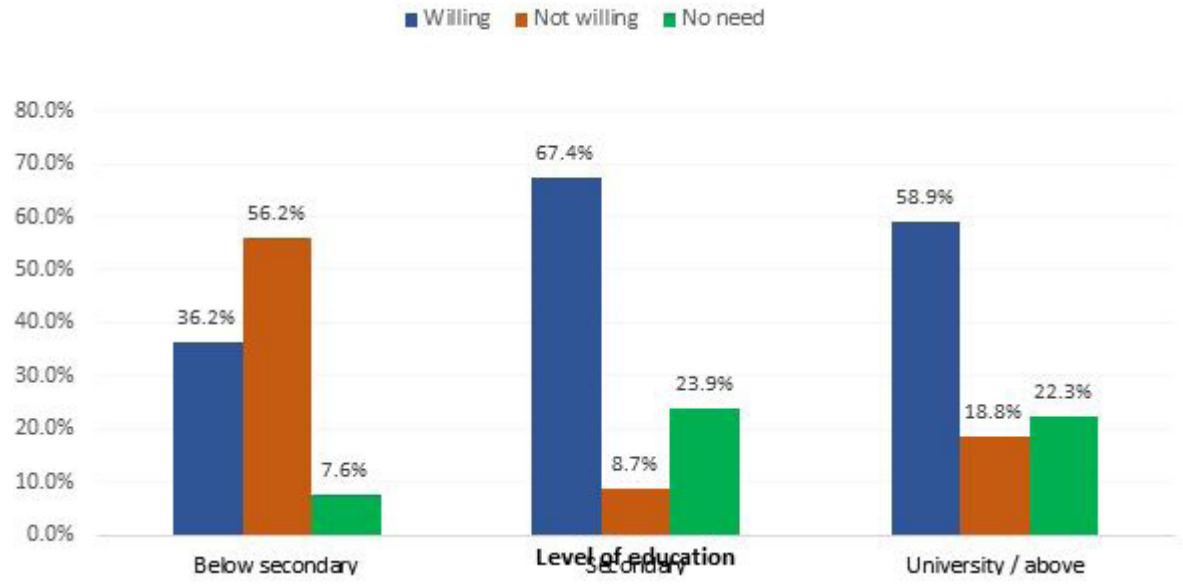

Figure 1: The relationship between education level and the willingness to reduce weight.

et al. [7] in Bangladesh, who found that nearly all the respondents (99%) have no idea regarding the meaning of obesity. Also, more than half of the patients ignore the normal blood glucose level (59%) and ideal body weight (59%). Besides, Akbar Q et al. [8] reported similar findings where more than half the T2DM patients cannot differentiate between obesity and overweight.

Additionally, 39.1% of obese patients ignore ideal body weight while they know the measurement. High-calorie consumption and poor physical activity were considered causes of obesity by most patients (63.3% and 62.4%, respectively). All these findings were consistent with other studies that concluded the lack of diabetic patients' awareness regarding obesity [7,9,10].

The study also showed that about two-thirds of the obese diabetic patients know about DM and HTN as a risk factor for obesity, and nearly half of them reported high cholesterol levels. As for causes, the most known obese cases were lack of exercise, high calories intake, and family history of obesity. Obirikorang Y et al. [9] reported that the most reported causes and risk factors of obesity among diabetic patients were poor diet (76.9%), hypertension (81.8%), and diet modification (86.7%), respectively.

Additionally, more than half of the obese diabetic patients are willing to reduce their weight, while one-

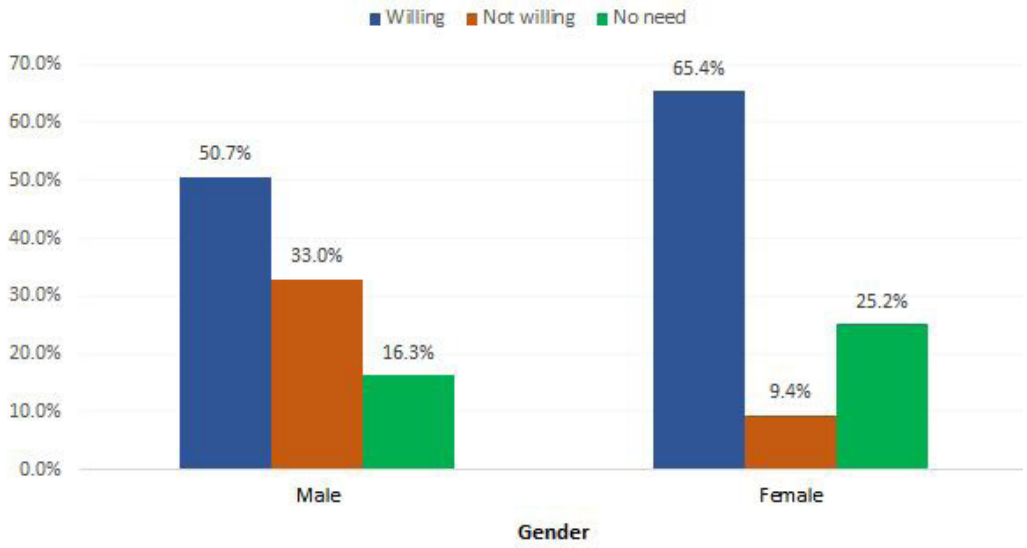

Figure 2: The relationship between gender and the willing to reduce weight.

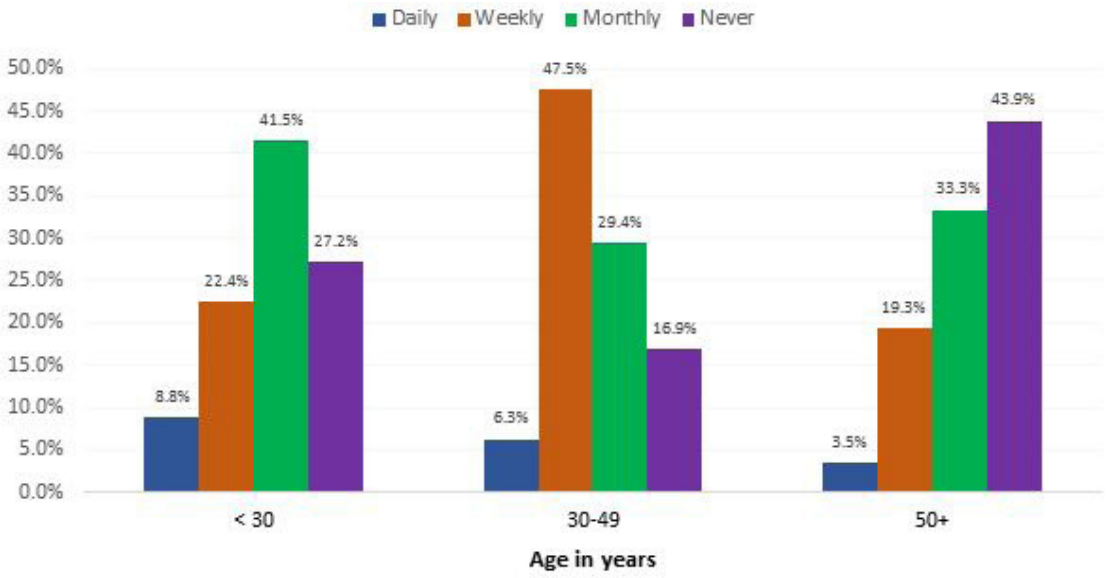

Figure 3: The relationship between participants' age and how often they check their weight.

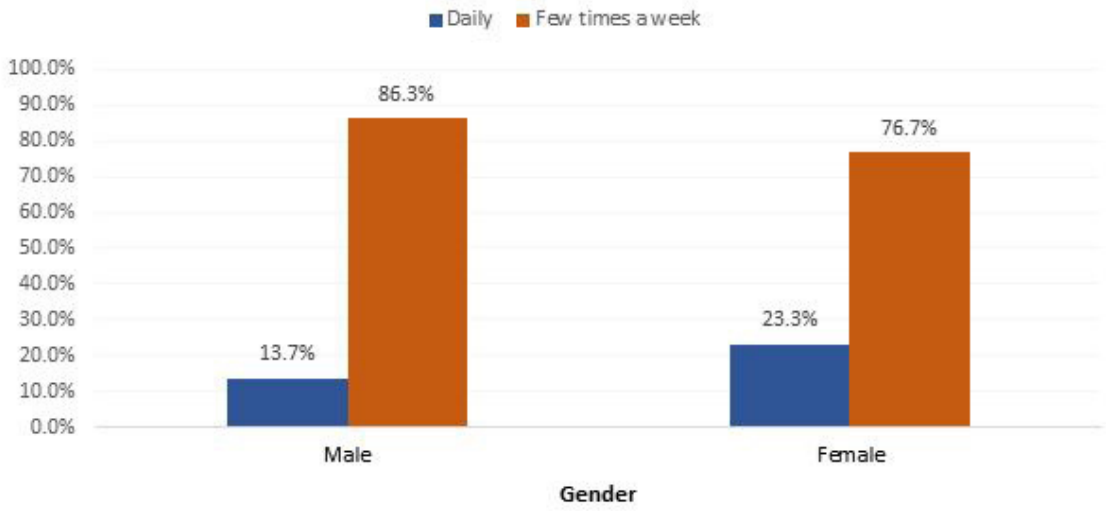

Figure 4: The relationship between frequency of exercise and participants' gender.

third of the non-obese think there is no need. The main reported reasons behind their willingness were fear of more complications and their appearance in society. This can be explained by the fact that obese patients may experience more complications with high restrictions in their daily life activities due to obesity and its related health consequences [8] Reported that fat diabetic patients showed higher readiness to lowering weight compared to non-fat patients and were stimulated by health and social reasons. Also, in the current study, obese patients showed a higher tendency for consulting a doctor to reduce weight, which is consistent with their willingness to improve their self-esteem and avoid dangerous complications. Most diabetic patients believe that having a proper understanding of their disease can help them to get a controllable state. It is important for an obese person with diabetes to lose weight. This can be reflected in their behaviour and practice in dealing with overweight or obesity status. A study conducted by Bolarinde S et al. [11] revealed that more than three-quarters (76.64%) of obese patients had adequate knowledge of Overweight / Obesity and weight control programs, and 69.5% established good attitudes toward weight control. Also, about one third (37.5%) of the respondent had a high level of active participation in weight reduction events.

As for patients practice, the current study showed that 83.4% of obese patients reported previous trials to reduce weight compared to 67.9% of non-obese patients (p=0.001). The most applied options among obese patients were exercise (81%) versus 72.4% for non-obese then following a dietary system (77.4% vs. 64.6%, respectively; P=0.001). Exercises were daily among 11.4% of obese patients compared to 23.9% of non-obese (P=0.009). About 88.7% of obese patients tried dietary systems to reduce weight versus 82.7% of non-obese. Many studies assessed post diabetes diagnosis lifestyle changes, behavior modifications and physical activity. Schneider et al. [12] reported that diabetic patients with a recent diagnosis were more likely to increase their physical activity. Also, Penn et al. found that the diagnosis is a motivational issue for diabetic cases to exercise and track a healthy diet [13]. Findings by Chong et al. estimated modifications in participants' lifestyles after being diagnosed with DM [6]. Though patients' awareness alone is insufficient for lifestyle modification, as revealed, other factors, including attitude and incentives, are also important. For example, in this study, most respondents showed the frequent measurement of their weight, blood glucose level, and blood pressure [15-19].

CONCLUSION

Obesity is considered one of the major factors that countered diabetes as known, especially diabetes type 2, due to its strong relation and insulin resistance besides other affective factors. In this study, we investigated the behavioral and consciousness of diabetes type 2 in the existence of obesity or not, measuring the behavior and the actions toward obesity due to the fact obesity is a challenging issue abroad diabetes. About half of these categories realised the strong association and were willing to take action. Also, less than half know the difference between obesity and overweight. The present study looks into obesity in diabetic patients in greater depth, examining more aspects such as previous obesity behavior. Health issues related to the glycemic index. This research will aid public policymakers in developing a more effective evidence-based and informed communication strategy. As a result, enough efforts must be made to raise awareness of obesity and its repercussions. The availability of precise information and the availability of accurate information is critical to the success of such endeavors.

LIMITATIONS AND RECOMMENDATIONS

This study only focused on a limited time and area, which could have restricted the generalization of the findings. In addition, even though the sample was collected from all of the country's major areas, sample sizes in various regions differed, which might be a limitation of the current study. Another limitation of this study was the low responses. Also, the sample could be biased since we did not use a random sampling method to enrol the participants.

We recommend setting plans that improve the behaviors and practices of T2DM patients regarding obesity. Also, interventions are required to provide patients with the tools they require to manage their condition effectively. Further research is recommended on a large scale to address the poor behaviors and practices of T2DM patients regarding obesity.

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AUTHORS CONTRIBUTIONS

This work was performed in collaboration with all authors. They designed the study, collected and processed questionnaires, created the manuscript, and approved the final version of the manuscript.

CONFLICT OF INTERESTS

The authors declare that there are no conflicts of interest.

DATA AND MATERIALS AVAILABILITY

All data associated with this study are present in the paper.

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