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Physical activity prevalence and barriers among type 2 diabetic patients, Kudai and Al-hijra primary health care center, Makkah, Saudi Arabia

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ABSTRACT

Background: Physical activity (PA) is regarded a cornerstone of diabetes management in patients with type 2 diabetes mellitus (T2DM). PA has variety of benefits to diabetic patients as it improves control of their blood glucose levels and reduces glycosylated hemoglobin, decreases patient's mortality risks (20 to >37 % reduction), improves cardiovascular outcomes, insulin secretion and enhance body weight maintenance. **Methods:** We used a valid questionnaire called the International Physical Activity Questionnaire (IPAQ) to estimate the prevalence of physical activities among patients with type 2 diabetes mellitus, in addition to barriers that prevent them from practicing exercise. **Result:** This study had a total of 157 individuals. 51.6% engaged in low-intensity physical activity, 28.7% in moderate activity, and 19.7% in high-intensity physical activity. Laziness and lack of energy (40.8%), health related issues (38.9%), lack of nearby dedicated facilities (30.6%), lack of time (29.9%) and weather conditions (27.4%) were the most common barriers prevent patients from practicing physical activity among T2DM patients. Female patients were more uncomfortable to engage in exercise in public areas compared to male patients (21.9% vs. 6.5%). **Conclusion:** Physical activity was importantly related to age, educational level, occupation, and working hours per day among patients with T2DM. PA was generally reduced in the majority of the patients in our study.

Keywords: Physical Activity, Prevalence, Type 2 diabetes, Barriers, Saudi Arabia

1. INTRODUCTION

The prevalence of type 2 diabetes mellitus is second highest in the Middle East in Saudi Arabia (SA). The percentage of T2DM in SA has dramatically risen to 27.6% in 2013 as it was 1.8% in 1998, and now it's ranked as the 65th most prevalent factor in death worldwide and Saudi Arabia's top four causes of death (Mohamed et al., 2020). PA is a critical part of T2DM management. Energy expenditure that greatly enhanced by any movement of the body is defined as PA (Alzahrani et al., 2019). The American Heart Association (AHA) and the American Diabetes Association (ADA) both recommend at least 150 minutes of physical activity per week, accomplished in at least 3 days, and not performed in more than 2 consecutive days (Al-Kaabi et al., 2009). PA has a lot of advantages for T2DM patients, not only for glycemic reduction and hemoglobin A1C decreasing (Oyewole, 2014). But also reducing patients' mortality risks (20 to >37 % reduction) provides beneficial cardiovascular outcomes (Alghafri et al., 2017) improves insulin secretion and helps patients control their body weight (Cartagena et al., 2021). However not all patients with T2DM achieve the PA goals. Also, Martin et al., (2021) detected that more than half of Americans' diabetic patients did not achieve the PA recommended level. And in Argentina only 51% managed to perform low level PA.

In the Arabian gulf region. A study in Oman reported that only 21.6% of T2DM met the recommendations for PA (Alghafri et al., 2017). Al-Kaabi et al., (2009) detected that only 3% of the United Arab Emirates (UAE) population met the PA requirements. PA recommendations were followed only in 26.3 % of T2DM female patients in Saudi Arabia, according to a study in Riyadh (Mohamed et al., 2020). In 2010, Alghafri et al., (2017) found more than 96 % of Saudi Arabians were physically inactive. This makes investigating the barriers to achieve target PA important. Reported barriers to PA include Lack of motivation, shortage of time and commitment to family, insufficient social support and energy and apprehension of injury (Alzahrani et al., 2019; Cartagena et al., 2021). Overestimation of PA has also been associated, particularly in young males. Individuals with a low body mass index are also at risk (Long et al., 2013). While other patients reported physically limiting comorbidities such as arthritis and previous major surgeries as a barrier (Booth et al., 2013).

In our study, we roughly measured how much physical activity is prevalent among individuals with T2DM, additionally the obstacles that stop them from exercising.

2. MATERIAL AND METHODS

Study design

Between the 15th of November and the 1st of December 2021, 157 T2DM patients who visited Kudai and Al-Hijra primary health care centres participated in a cross-sectional study. This study based on questionnaire. All patients who diagnosed with T2DM based on ADA criteria invited to fill their questionnaires (American Diabetes Association, 2021). Patients whose ages were between 15 and 69 are able to provide informed consent. All patients who approved to contribute in the study were included. Pregnant women, patients who are known to have physical disability, non-Arabic speakers and incomplete questionnaires were excluded.

Data collection

The self-administrated questionnaire was distributed among all patients meeting the inclusion criteria in Arabic language. After we exclude 11 patients because of incomplete questionnaires a total of 157 patients were approved to proceed for data analysis.

Study tool

The survey comprises three components, sections: first, socio-demographic information which includes age, gender, marital status, educational status, family income per month, smoking status, history of mental disorders, employment status, and daily working hours. The form of the International Physical Activity Questionnaire was used to evaluate the PA level in the 2nd part of the questionnaire. The third component included 11 items that identified obstacles to practicing physical activity.

IPAQ short form

IPAQ is reliable and valid questionnaire, also valid in many languages including Arabic language that has been used in this study. IPAQ short form used to estimate how much the participant is physically active. The raw data was processed and entered for data analysis according to IPAQ scoring protocol (Short Form). Both categorical and continuous variables can be assessed by IPAQ questionnaire. IPAQ assess duration and frequency of 3 levels of physical activities: walking, moderate intensity, and vigorous intensity physical activities for the last week. Continuous variables were presented as Metabolic Equivalent of task/minute/week (METs-min/week). A minute of walking equals 3.3 METs; however, a minute of moderate-intensity PA equals 4.0 METs, while a minute of high-intensity PA equals 8.0 METs. The total MET-minutes/week was calculated by combination of walking MET-

minutes/week, moderate intensity activity MET-minutes/week and vigorous intensity activity MET-minutes/week. Categorical variables categorized into low, moderate, and high physical activity. Low level of PA is proposed if there is no activity, or some activity is reported but not enough to meet moderate or high categories.

We categorized the patients under moderate level of PA when they met one of the following criteria: daily ≥ 20 minutes of vigorous physical activity for more than 2 days per week, daily ≥ 30 minutes of moderate-intensity physical activity and/or walking for more than 4 days per week, or accomplishment of 600 METs minutes per week by a combination of any of the 3 types of physical activity, completed in at least 5 days. While we supposed the patients are highly active when they met one of the following requirements: either achieving 1500 METs minutes per week or more in more than 2 days per week of vigorous exercise, or daily activity that can be any of the 3 types of PA that achieve ≥ 3000 METs minutes per week (International Physical Activity Questionnaire, 2005; Booth, 2000).

Statistical analysis

Since all variables were categorized, they were described in the form of frequency and percentage. Analytical statistics was performed using Chi-square test or Fischer exact test (in case of small frequencies) to test for the correlation between level of PA and associated factors. P-value ≤ 0.05 was considered to determine statistical significance. Data entry and statistical analysis were performed using SPSS, version 26 software.

3. RESULTS

A total of 157 T2DM patients were established in the current study. Their personal characteristics are summarized in Table 1. 57.9% of our population older than 40 and younger than 60, while 21.7% were older than 60. Males represented 59.2% of them, and 74.6% were married. More than one-third of patients (35.1%) were university or above graduated while 12.7% were illiterates. The family income was less than 4000 SR/month among 38.9% of patients whereas it exceeded 20000 SR/month among 9.6% of them. The prevalence of smoking was 22.9% and history of psychological diseases was observed among 8.3% of patients. 35.7% of the patients were employees and the most of them working for 7-8 hours (65.6%).

Table 1 Personal characteristics of T2DM, Makkah, Saudi Arabia (n=157)

Variables	Frequency	Percentage
Age (years)		
15-30	14	8.9
31-40	18	11.5
41-50	44	28.0
51-60	47	29.9
>60	34	21.7
Sex		
Male	93	59.2
Female	64	40.8
Marital status		
Single	20	12.7
Married	117	74.6
Divorced	12	7.6
Widowed	8	5.1
Educational level		
Illiterate	20	12.7
Primary school	16	10.2
Intermediate school	25	15.9
Secondary school	41	26.1
University	46	29.4
Postgraduate	9	5.7
Family income (Saudi Riyals/month)	61	38.9

<4000	56	35.6
4000-11000	25	15.9
>11000-20000	15	9.6
>20000		
Smoking status		
Smoker	36	22.9
Non-smoker	121	77.1
History of psychological diseases		
No	134	85.4
Yes	13	8.3
Don't know	10	6.4
Occupation		
Employee	56	35.7
Business/trading	12	7.6
Housewife	43	27.4
Nor working	46	29.3
Number of working hours/day		
7-8	103	65.6
8	38	24.2
>8	16	10.2

Physical activity level

We defined physical activity as low when the patient's MET min/week is less than 600, More than half (51.6%) of our population used to have a low level of physical activity, whereas 28.7% of patients used to have a moderate level, defined as between 601 and 3000 MET min/week, while figure 1 shows that 19.7% of patients used to have a high level of PA, defined as ≥ 3001 MET min/week. Regarding type of PA, as indicated in Figure 2, 16.6% of the patients engaged in vigorous physical activities, moderate physical activities detected in 32.5% of them, and walking was reported by the majority (76.4%). Regarding duration of sitting (minutes/day), Figure 3 shows that almost two-thirds of patients (68.8%) reported sitting period ≤ 360 minutes/day.

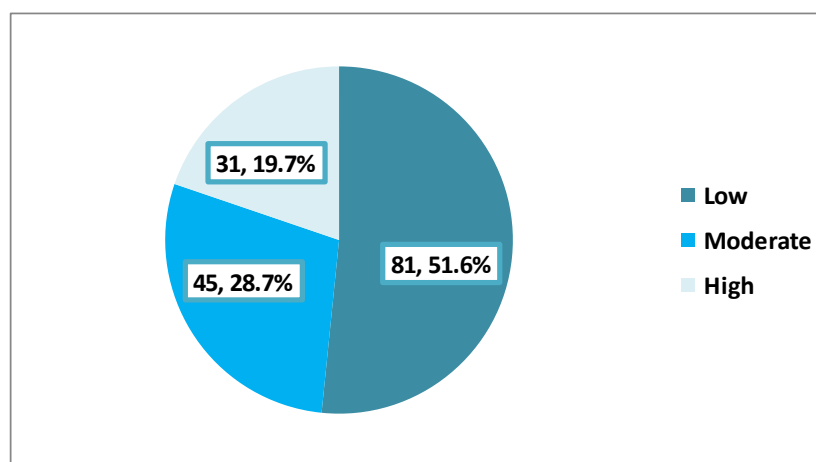


Figure 1 Level of PA for T2DM patients, Makkah, Saudi Arabia

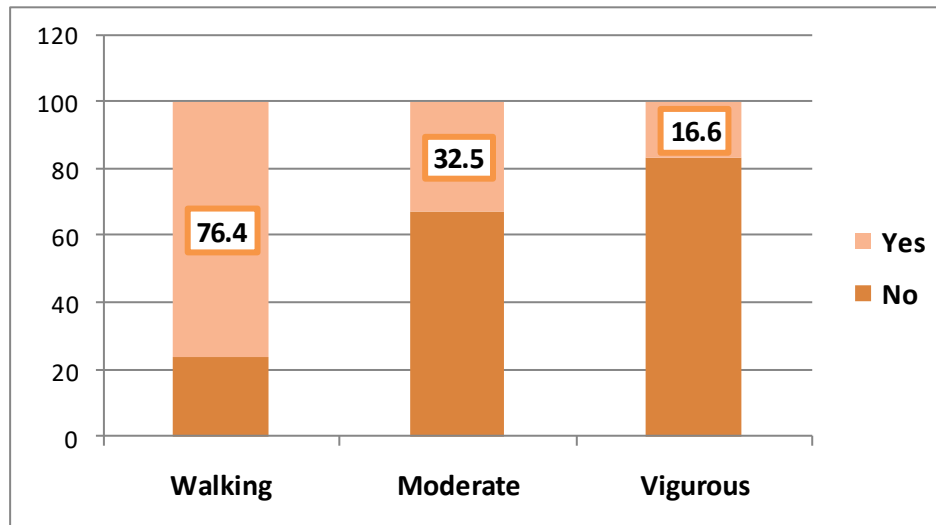


Figure 2 Type of PA for T2DM patients, Makkah, Saudi Arabia

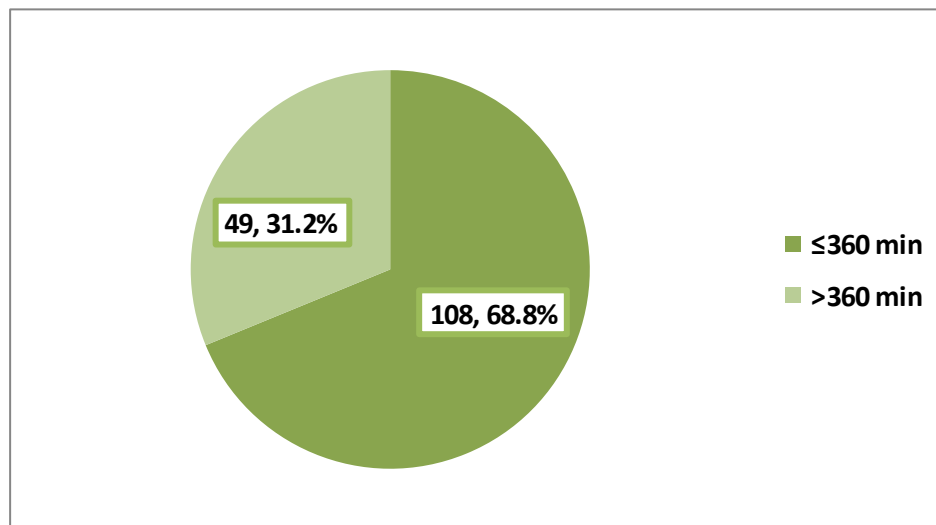


Figure 3 Duration of setting, expressed as minutes/day, among T2DM patients, Makkah, Saudi Arabia

Level of physical activity-related to factors

The age group of 15-30 years shows the highest rate of high physical activity (42.9%), while the lowest rate was noticed amongst patients over 60 years (11.8%). However, the difference did not approach the statistical significance threshold ($p=0.064$). The highest amount of high level PA observed among patients with a secondary school education (29.3%), while illiterates reported none. We found statistical significance in the correlation between the level of physical exercise and educational degree, $p=0.005$. Among occupation categories, employees had the highest rate of high physical activity level (30.4%) while workers in business and trading had the lowest rate (8.3%), $p=0.044$. It was revealed that patients who worked an average of eight hours per day engaged in more vigorous exercise (34.2%) in comparison to patients who worked for more than eight hours per day (12.5%), $p=0.029$. Physical activity level in our population was not found to be substantially associated with their gender, marital status, family income, smoking status, or history of psychological illnesses (Table 2).

Table 2 Level of physical activity-related to factors for T2DM, Makkah, Saudi Arabia

Gender	Physical activity level			p-value*
	Low N=45 N (%)	Moderate N=49 N (%)	High N=6 N (%)	

Age (years)				
15-30 (n=14)	6 (42.9)	2 (14.2)	6 (42.9)	0.064
31-40 (n=18)	5 (27.8)	10 (55.6)	3 (16.7)	
41-50 (n=44)	23 (52.3)	11 (25.0)	10 (22.7)	
51-60 (n=47)	25 (53.2)	14 (29.8)	8 (17.0)	
>60 (n=34)	22 (64.7)	8 (23.5)	4 (11.8)	
Sex				
Male (n=93)	48 (51.6)	31 (33.3)	14 (15.1)	0.118
Female (n=64)	33 (51.6)	14 (21.9)	17 (26.6)	
Marital status				
Single (n=20)	9 (45.0)	6 (30.0)	5 (25.0)	0.345
Married (n=117)	60 (51.3)	36 (30.8)	21 (17.9)	
Divorced (n=12)	5 (41.7)	3 (25.0)	4 (33.3)	
Widowed (n=8)	7 (87.5)	0 (0.0)	1 (12.5)	
Educational level				
Illiterate (n=20)	18 (90.0)	2 (10.0)	0 (0.0)	0.005
Primary school (n=16)	7 (43.8)	7 (43.8)	2 (12.4)	
Intermediate school (n=25)	16 (64.0)	6 (24.0)	3 (12.0)	
Secondary school (n=41)	21 (51.2)	8 (19.5)	12 (29.3)	
University (n=46)	16 (34.8)	18 (39.1)	12 (26.1)	
Postgraduate (n=9)	3 (33.3)	4 (44.5)	2 (22.2)	
Family income (Saudi Riyals/ month)				
<4000 (n=61)	34 (55.7)	18 (29.5)	9 (14.8)	0.238
4000-11000 (n=56)	32 (57.1)	12 (21.4)	12 (21.4)	
>11000-20000 (n=25)	9 (36.0)	8 (32.0)	8 (32.0)	
>20000 (n=15)	6 (40.0)	7 (46.7)	2 (13.3)	
Smoking status				
Smoker (n=36)	18 (50.0)	14 (38.9)	4 (11.1)	0.175
Non-smoker (n=121)	63 (52.1)	31 (25.6)	27 (22.3)	
History of psychological diseases				
No (n=134)	64 (47.8)	41 (30.6)	29 (21.9)	0.223
Yes (n=13)	10 (76.9)	2 (15.4)	1 (7.7)	
Don't know (n=10)	7 (70.0)	2 (20.0)	1 (10.0)	
Occupation				
Employee (n=56)	21 (37.5)	18 (32.1)	17 (30.4)	0.044
Business/trading (n=12)	7 (58.3)	4 (33.3)	1 (8.3)	
Housewife (=43)	28 (65.1)	7 (16.3)	8 (18.6)	
Nor working (n=46)	25 (54.3)	16 (34.8)	5 (10.9)	
Number of working hours/day				
7-8 (n=103)	60 (58.3)	27 (26.2)	16 (15.5)	0.029
8 (n=38)	15 (39.5)	10 (26.3)	13 (34.2)	
>8 (n=16)	6 (37.5)	8 (50.0)	2 (12.5)	

*Chi-square test

Barriers to physical activity

Barriers that prevent T2DM patients from achieving the minimum required level of exercise as shown in table 3 were laziness and lack of energy in 40.8% of them, health-related issues found in 38.9%, lack of nearby dedicated facilities prevent 30.6%, deficient in

time was the issue in 29.9% and weather conditions reported in 27.4%. The feeling of uncomfortable engaging in an exercise in public areas found to be more in females compared to males (21.9% vs. 6.5%), $p=0.004$. Other barriers between males and females were not found to be significantly different in our study.

Table 3 physical activity barriers in T2DM males compared to females

	Males N=93 N (%)	Females N=64 N (%)	Total N=157 N (%)	p-value
Health related issues	35 (37.6)	26 (40.6)	61 (38.9)	0.706*
Lack of time	28 (30.1)	19 (29.7)	47 (29.9)	0.955*
Lack of motivation	22 (23.7)	20 (31.3)	42 (26.8)	0.291*
Lack of safe place to exercising	14 (15.1)	12 (18.8)	26 (16.6)	0.540*
Lack of nearby dedicated facilities.	26 (28.0)	22 (34.9)	48 (30.6)	0.355*
Feeling uncomfortable to engage in exercise in public areas.	6 (6.5)	14 (21.9)	20 (12.7)	0.004*
Weather conditions	27 (29.0)	16 (25.0)	43 (27.4)	0.578*
Laziness, lack of energy	38 (40.9)	26 (40.6)	64 (40.8)	0.976*
High cost of dedicated facilities.	16 (17.2)	14 (21.9)	30 (19.1)	0.464*
Others	9 (9.7)	5 (7.8)	7 (4.5)	0.687*
No barriers	3 (3.2)	4 (6.3)	14 (8.9)	0.301**

*Chi-square test

**Fischer Exact test

4. DISCUSSION

Level physical activity

This study's objective was to evaluate the levels of physical activity of T2DM patients at Kudai and Al Hijra primary care center in Makkah, Saudi Arabia. This revealed that most of the population is engaged in low physical activity of 51.6%, Moderate level physical activity in 28.7% of patients. Following that, high physical activity levels were recorded in 19.7% of patients, as reported similarly by Kennerly and Kirk in the USA, with Low physical activity 55.6%, Moderate physical activity 34.8%, and High physical activity 9.6% (Kennerly and Kirk, 2018). Shiriyedeve et al., (2019) in Gaborone, Botswana reported 54.7% low PA among T2DM patients and martin et al., (2021) reported 52.3% of Argentine diabetics performed low level PA. In the other hand our study results were different to some countries like in Brazil where Low PA was 30.8%, Moderate 60.6% and High (8.7%), also in France Low PA was 15.1%, Moderate PA 51.3% and High PA 33.6%, which they reported a lower percentage of low PA and much higher level of Moderate PA (Kennerly and Kirk, 2018).

Type of physical activity

The most popular form of PA was found to be walking (76.4 %), the same was detected in patients in the UAE, where walking is conducted in 78 % of the patients, according to Al-Kaabi et al., (2009) Moderate of physical activity accounts for 32.5 % of the patients, while Vigorous physical activity accounts for 16.6%.

Sitting time

Regarding duration of sitting (minutes/day), almost two-thirds of our patients (68.8%) reported sitting period ≤ 360 minutes/day, This corresponds to 288 minutes per day in Nigeria, 348 minutes per day in Botswana, and 349.2 minutes per day in the USA (Kennerly and Kirk, 2018; Shiriyedeve et al., 2019). Alghafri et al., (2017) in Muskat, Oman reported much higher sitting time with Females sitting time 720 min/day vs males 660 min/day and Mohamed et al., (2020) revealed that females with T2DM sat for an average of 689 ± 40.6 minutes a day in Riyadh, Saudi Arabia.

Level of physical activity-related to factors

We discovered that educational levels were substantially correlated to PA levels in our study population. A total of 46 patients had a university degree, moderate to high levels of PA were observed in more than 65%, whereas low levels of PA were present in most of the illiterate population (90%) ($p=0.005$). This is in agreement with a study that conducted in the U.S that showed similar findings as college degree population were more physically active (64.7%) than high school population (48.3%) (Morrato et al., 2007). Another study underwent in southwest Ethiopia indicated that 75.7% of illiterate individuals had lower rate of physical exercise compared to those with higher education levels (43.6%), In addition, Mohamed et al., (2020) in SA discovered that 58.3% of females with a high level of education (university and above) fulfilled physical activity requirements, whereas only 13% of illiterate individuals reached the necessary level of PA (Negera and Epiphany, 2020). In regard of occupation our results revealed a significant difference in activity levels in employees comparable to unemployed patients ($p=0.04$), with employees being more active (62.5%) than the unemployed population (45.7%). A research in Botswana found that employees were more active, with 45.5% of them engaging in moderate physical activities, compared to 29.6% of the jobless population (Shiriyedev et al., 2019). A study from Oman also revealed same outcomes of 50% of government employee and 37% of non-government employee were physically active compared to unemployed who only 10% of them were active (Alghafri et al., 2017).

Barriers to physical activity

We identified that the most prevalent obstacle to physical exercise faced by our patients was laziness and lack of energy (40.8%), which was considered a barrier by 40.9% of male patients, while among female patients this percentage decreased by 0.3% compared to male patients. Health related issues was the second most prevalent barrier (38.9%), whereas the same number of female patients who consider laziness and lack of energy as a barrier also consider health related issues a barrier for them, while this percentage decreased by 3% in male patients in comparison with females. According to a study from Oman, the most prevalent barrier overall is a lack of willpower (45.5%), followed by a lack of resources (30.5%). The most common barrier among males was similarly a lack of will power (41.5%), and the same barrier was the most prevalent among females (48.6%), while lack of resources was the second most frequent obstacle in men (32.3%), lack of social support was the second most prevalent barrier in females (35.4%) (Alghafri, 2017).

Another research done in Argentina indicated different frequent obstacles, with lack of willpower being the most common (59.6%) and lack of energy being the second most common (37.2%) (Martin et al., 2021). Our findings contrasted with those of a Saudi Arabian study, which found that lack of resources is the most prevalent obstacle overall (48.4%), and the most common among males (37%) and among females (63%) (Alzahrani et al., 2019). We discovered that feeling uncomfortable to engage exercise in public areas was the most significant difference in the barrier between males and females, and female patients were more likely than males to feel uncomfortable to engage in exercise in public areas, with 6 out of 20 male patients and 14 out of 20 female patients ($p=0.004$) considering it as a barrier.

Unlike our data, a study done in Saudi Arabia found that lack of skills is the most significant difference in barrier between male and female patients, with 15 out of 74 men and 59 out of 74 females ($p=0.0005$), other statistically significant difference in barrier reported by the study includes the Lack of willpower reported by 75 female and 32 male of 107, the Lack of energy reported by 64 female and 18 male of 82, and the Lack of social support reported by 40 female and 14 male of 54 ($p=0.04$, 0.005, 0.04 respectively) (Alzahrani et al., 2019).

5. CONCLUSION

In conclusion, the level of physical exercise in T2DM patients was importantly related to their age, educational status, employment status, and the number of hours worked, and it was low among most of the patients in the study. In terms of gender, marital status, family income, whether or not a smoker, and a history of mental diseases, they were not shown to be substantially correlated to the level of PA. In terms of gender, female patients were more embarrassed to exercise in public areas, whereas the other obstacles were not significant enough to distinguish between the two genders.

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Author Contributions

All authors contributed equally to this work.

Ethical approval

The study was approved by the biomedical Research Ethics Committee of Umm Al-Qura University (ethical approval code: HAPO-02-K-012-2021-10-807).

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

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

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