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THE EFFECT OF OBESITY AND ITS ASSOCIATED RISK FACTORS ON PATIENTS WITH TYPE 2 DIABETES WHO ATTEND IN PRIMARY HEALTH CARE CENTER IN MAKKAH AL-MOKARRAMAH 2021

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ABSTRACT:

Background:

Overweight and obesity constitute a global pandemic with devastating consequences that affect >2 billion people. Obesity plays a central role in morbidity and mortality of diseases of multiple organs and systems, and it is a major contributor to the growing incidence of type 2 diabetes. There is now sufficient level of evidence for the association between overweight and type 2 diabetes, among which are the most common type 2 diabetes worldwide. Obesity results from a combination of personal and societal factors, but is often viewed as a character flaw rather than a medical condition. This leads to stigma and discrimination towards obese individuals and decreases the likelihood of effective intervention. Conditions related to obesity are increasingly common, such as metabolic syndrome, impaired fasting glucose (IFG) and impaired glucose tolerance (IGT), all of which indicate high risk for type 2 diabetes (T2DM). Sedentary lifestyle, unhealthy diet, and excessive alcohol intake also account for the burden of type 2 diabetes by promoting obesity. The risk of specific type 2

diabetes is also directly influenced, regardless of the magnitude of adiposity, by physical inactivity, consumption of red meat, processed meat and ultra-processed foods, dairy products, alcohol, whole grain cereals, nuts, vegetables, and fruits. **The study aimed**: To assess the effect of obesity and its associated risk factors on patients with type 2 diabetes who attend in primary health care center in Makkah al-Mokarramah 2021. **Method:** A cross-sectional study was conducted among patients with type 2 diabetes and obesity who registered in the chronic disease clinic attended diabetes centre in Makkah at Saudi Arabia in 2021. Our total participants were (300).**Results**: the total number of participants was 300 were males and female. The participants were classified into 3 age groups, most of them were (54.3%)in the <30 years fallowed by 39-50 years were(29.3%), regarding gender of participated male were (70.3%), follow by female were(29.7 %), type of treatment do you use for diabetes, results show a significant relation between BMI and what type of treatment do you use for diabetes, also complications from diabetes, results show a significant relation between BMI and complications from diabetes, Physical activities or exercise, results show a significant relation between BMI and Physical activities or exercise. Eating a portion of fruit, results a significant relation between BMI and Eating a portion of fruit, eating a portion of vegetables, results show a significant relation between BMI and Eating a portion of vegetables **Conclusion:** Obesity is a highly prevalent comorbidity in type 2 diabetic patients. Some modifiable risk factors were identified. Multidisciplinary effort is warranted to reduce obesity among type 2 diabetic patients. appears to be a better indicator of diabetic risk than BMI. The combination of a low-calorie diet, increased physical activity, and behavioral therapy as the first-line intervention for weight loss should be stressed for the effective management of T2diabetic patients.

Keywords: Aassessment, effect, Obesity, Type 2 diabetes mellitus, Risk factors, Saudi Arabia

1.Introduction:

Background:

Diabetes is a major disease burden in KSA, and we are home to the second largest number of diabetes cases in the world [1]. In 2017, With changing lifestyles the prevalence of diabetes mellitus (DM) has been rising worldwide over the past few decades. According to a recent estimate by the International Diabetes Federation, the age-adjusted prevalence of diabetes in Saudi Arabia is 17.7%. [2]. Obesity can be defined simply as the disease in which excess body fat has accumulated to such an extent that health may be adversely affected. World Health Organization (WHO) reported that obesity is one of the most common and also the most neglected, public health problems in both developed and developing countries.[3] Obesity is strongly associated with other metabolic disorders, including diabetes, hypertension, dyslipidemia, cardiovascular disease even some cancers.[4]

T2DM is usually associated with micro- or macro vascular complications, including peripheral vascular disease, cardiovascular disease, diabetic neuropathy amputations, and renal failure. [6] At present, drugs and dietary control are effective therapy strategies for T2DM to achieve acceptable glycemic level [7]

It is a major contributor to the type 2 diabetes (T2DM) epidemic where nearly 88% of those with T2DM are considered overweight or obese. Despite the increased risk of poor clinical outcomes and negative impact on the quality of life, only one‐half of individuals with diabetes and other chronic conditions receive counseling on diet and/or exercise by their primary care provider.[8] Overweight and obesity have further been linked with poor control of blood pressure, cholesterol, and blood glucose levels among individuals with type 2 diabetes.[9]

Diabetes mellitus has reached epidemic levels, and it threatens the economy and health globally and Saudi Arabia in particular. Diabetes is a major disease burden in Saudi Arabia, and we are home to the second largest number of diabetes cases in the world. [10]

Waist circumference (WC) and waist–hip ratio (WHR) have been used as a measure of abdominal fat or central obesity. WC is a convenient and simple measurement that is unrelated to height, correlates closely with BMI and WHR, and is an approximate index of intra-abdominal fat mass and total body fat. [11]

Overweight and obesity also increases the likelihoods of suboptimal glycaemic control making it difficult to achieve glycaemic targets. [12]

As a result, the American Diabetes Association recommends and has developed guidelines for weight management in diabetic patients with overweight or obesity. [13] Sub-Saharan Africa is experiencing a rapidly increasing burden of obesity, diabetes and other non-communicable diseases. [14] However, there are limited reliable data on the prevalence of obesity and how this contributes to the risk of T2DM in the region. A few studies indicate that overweight and obesity affects up to half of the type 2 diabetes patients, with prevalence varying according to age and setting; 85% in Tanzania14 and 27.4%–83% in KSA.[15]

Saudi Arabia (KSA) notably has an obesity prevalence higher than the global average (35% vs. 13%).1 Consequently, SA suffers a higher share of deaths attributable to obesity (18% vs. 8%) and a higher death rate by obesity (116.7 per 100,000 vs. 60 per 100,000).[12] In response to the immense health and social ramifications of the obesity problem, the KSA government is implementing a wide range of policies in its Vision 2030 plan for a healthier population.[13] KSA has seen progressive approaches to obesity management, such as early adoption of day case bariatric procedures.[16]

1.2 Literature Review

Globally, 1 out of 11 adults have diabetes (415 million), also there are 5 million die from diabetes every year. Kingdom of Saudi Arabia (KSA) is now classified by the International Diabetes Federation to be among the top 10 countries globally with the highest prevalence of diabetes in 2015 (17.6%)[17]

A study conducted by Bilal Wani et al. who reported that prevalence of diabetes among women was higher than in men with the ratio of 1.41:1.[13] The prevalence of GO based on BMI was 58.68%. The mean BMI of the study participants was 25.89 Kg/m2. Study conducted in Warangal reported 59.2% of overweight and obese which is in par with our study.[15] Another study conducted in Bangalore reported 73% obesity with the mean BMI 26 Kg/m2.[17] Similar observation to our study was made in a study conducted by Shyaminda Kahandawa et al. reported the mean BMI of 26.4 Kg/m2.[18] The prevalence of

abdominal/central obesity assessed by WC was 81.84% in our study. "Asian Indian phenotype" is characterized by less of GO (measured by BMI) and greater central body obesity as shown by greater WC. In a study done in a rural area of Mangalore district of Karnataka showed higher central obesity prevalence (90.63%) when compared to BMI.[19] The prevalence of CO (GO and AO) in another study was 53.42%. Undavalli et al. reported that the prevalence of GO, AO, and CO was 56%, 71.2%, and 51.3%, respectively, which was similar to our observations.[19] The prevalence of obesity due to body fat percentage in our study was 85.5%, and the mean body fat percentage among males and females was 26.8 ± 7.89 and 43.87 ± 5.98, respectively. The findings of our study were on par with the study conducted by Ahmad Shirafkan et al. which reported body fat percentage among males and females as 31.55 ± 6.00 and 43.21 ± 5.31, respectively. [13] In our study, we had observed a significant gender difference in the prevalence of all types of obesity (GO, AO, and CO). A high prevalence of obesity was noted in females than in males. These results are in accord with those reported from both in general population and among patients with T2DM conducted in India,[20], Iran,[21] Tanzania, and Saudi Arabia [13].also anther study showed that the prevalence of GO, AO, and CO was high among those with hypertension. This observation is in line with the findings of the study conducted by Pradeepa et al.[20]Another study showed that the change in waist was a better predictor of the change in visceral adipose tissue.[22] WC captures information on general as well as abdominal obesities including both abdominal subcutaneous fat and visceral adipose.[17]

Numerous literature has documented that obesity is an important modifiable risk factor for type 2 diabetes. Furthermore, it has been linked to many adverse health consequences including hypertension, hyperglycaemia, dyslipidaemia, cardio-vascular diseases, osteoarthritis, gallbladder diseases, respiratory tract diseases and psychiatric disorders [19]. According to the World Health Organization Global Report on Diabetes (2016), obesity as well as physical inactivity are responsible for increasing prevalence of diabetes [23]. Obesity is strongly linked to insulin resistance, which, when associated with relative insulin deficiency, leads to the development of type 2diabetes mellitus [18]

1.3 Rationale:

With the changes in major lifestyles, the prevalence of obesity is increasing; therefore, this issue implicated to complicate the diabetes outcome, well -being and productivity. Improved quality of life has been regarded as a key goal of all healthcare interventions including a special interest in obesity and its related complication, particularly in type II diabetic patient's obesity and affected to diabetes mellitus management. Up to the researcher's knowledge the prevalence of obesity is increasing; therefore, this issue implicated to complicate the diabetes outcome. The researcher has a special interest in obesity and its related complication, particularly in type II diabetic patients.

2. Aim of the Study

To assess the effect of obesity and its associated risk factors on patients with type 2 diabetes who attend in primary health care center in Makkah al-Mokarramah 2021

2.1 Objectives

- This study was performed To assess the effect of obesity and its associated risk factors on patients with type 2 diabetes who attend in primary health care center in Makkah al-Mokarramah 2021
- To estimate the prevalence of obesity among type II diabetic patients attending primary health care center in Makkah Al-Mukarramah, 2021.

3. Methodolog:

3.1 Study design:

A cross-sectional study was conducted among patients with type 2 diabetes and obesity. Registered in the chronic disease clinic attended diabetes centre in Makkah at Saudi Arabia in 2021, Participants were interviewed and their medical records were reviewed. Our total participants were (300)

3.2Study area and population:

All type 2 Diabetic patients who registered in chronic disease clinic in attended diabetes centre in Makkah at Saudi Arabia in 2021, in the time of study conduction.

Inclusion criteria

- All type II diabetic patients.
- Both males and females.
- Saudi and non-Saudi.

Exclusion criteria :

- No speaks Arabic fluently
- Patients who refuse to participate in the study
- Persons who have reported severe mental disabilities

3.3 Sample size:

Sample size was calculator by Raosoft Online sample size calculator . It was (300) patients, based on assumption that during the last 4 weeks, the total number of diabetic patients who visited the chronic disease clinic at was 320 patients, prevalence was considered as 50%, confidence level was 95%, margin of error was 5%. By adding 10% for defaulter and non-respondent, 300 patients were invited to participate in the study

3.4 Sampling technique

Systematic random sampling technique is adopted. After that, by using random number generator, then simple random sampling technique has been applied to select the PHC. Also, convenience sampling technique will be utilized to select the participants in the study. Ten patients were selected daily by choosing every other patient. Thus, nearly 30 working days were needed to collect the sample by using systematic sampling random as dividing the total patients by the required sample size; (300).

4.Data collection tool

Self-administrated questionnaire was used for data collection. It was adopted from a previous Saudi study. [24] Some modifications were done and the new format was validated by three consultants (family medicine, Endocrinology and community medicine). The final draft of the questionnaire consists of two sections:

-First section: Includes socio-demographic and personal characteristics of the participants.

-Second section: Includes associated factors with obesity in type II diabetic patients (smoking, physical exercise, diet habit. Additionally, the body mass index (BMI) was calculated by an expert nurse.

4.1 Data Collection technique

- During the study period (1th January to 1st February 2021), the researcher was available at the involved primary healthcare centers five days in the week to clarify any issue.
- The researcher distributed the questionnaire in the waiting area by themself to the selected patients.
- The questionnaires were collected at the same time.

4.2 Study variables

Dependent variable: Obesity in type 2 diabetic patients. It was defined as body mass index>30 Kg/m.

Independent variables: Age, gender, nationality, marital status, educational level, income level, marital status, smoking, physical exercise, dietary habits, duration of diabetes, type of treatment, complications and history of co-morbid chronic diseases

4.3 Data entry and analysi

Data were entered and analyzed using the Statistical Package for Social Sciences (SPSS version 27). Categorical variables were presented as frequency and percentage whereas continuous variables were presented as mean and standard deviation (±SD). Results were presented as adjusted odds ratio (AOR) and its 95% confidence interval (CI). Statistical significance was determined at $p<0.05$ for all comparisons.

5. Pilot study/pretesting:

A pilot study was conducted on 16 patients, representing approximately 10% of the sample size. It was done in another PHCC rather than those involved in the study to test the clarity of the questions and feasibility of the methodology. No modifications were made according to the pilot results.

5.1 Ethical considerations

Research committee approval ,Written permission from the joint program of family medicine in Makkah Al-Mukarramah,Written permission from concerned authority in Ministry of Health (MOH) PHCC in Makkah Al-Mukarramah , Individual verbal consent from all participants before data collection , Acknowledgments of all supervisors, advisors, helpers, facilitators and participants. All collected data were kept confidential.

5.2 Relevance & expectations

This study provides information about the prevalence of obesity among type II diabetic patients. Also, a possibility of relevant risk factors may contribute to obesity in the diabetic patient. This could help policy makers to set strategies to combat obesity among type 2 diabetic patients.

6.Budget:

The research has be self-budgeted

7. Results

-Response rate in the study included 300 patients, out of invited 350 (Response rate = 91.4%).

Table 1. Distribution of Socio-demographic characteristics of the studied participated

(Age, Gender, Marital status, Level of education, BMI, Smoking) Smoker (n- 300).

	N	%
Age		
<35	163	54.3
35-50	88	29.3
>50	49	16.3
Gender		
Female	89	29.7
Male	211	70.3
Marital status		
Single	30	10.0
Married	186	62.0
Divorced	39	13.0
Widow	45	15.0
Level of education		
Non	13	4.3
Primary education	31	10.3
Lower secondary education	32	10.7
Upper secondary education	58	19.3
Post-secondary	37	12.3
Tertiary education	129	43.0
BMI		
Under weight	32	10.7
Normal	49	16.3
Overweight	95	31.7
Obese	124	41.3
Range	18.40±45.5	
Mean±SD	30.760±6.136	
Smoking		
Smoker	156	52.0
Non smoker	144	48.0

Table 1 show the total number of participants was 300 were males and female. The participants were classified into 3 age groups, most of them were (54.3%)in the <30 years flowed by 39-50 years were(29.3%), regarding gender of participated male were (70.3%), follow by female were(29.7 %), regarding Marital status the majority of participated Married were (62.0%), flowed by Widow (15.5%). Regarding Educational level in study the most of participant's tertiary education were (43.0%) while upper secondary education were (19.3%), regarding Body Mass Index most of participated Obese were (41.3%), follow by

Overweight were(31.7 %) while range (18.40-45.5) and Mean± SD (30.760±6.136). Only 52.0% among the participants smoker while non-smoker were (48.0%) .

Figure 1 Distribution of Socio-demographic characteristics of the studied participated in BMI (n- 300).

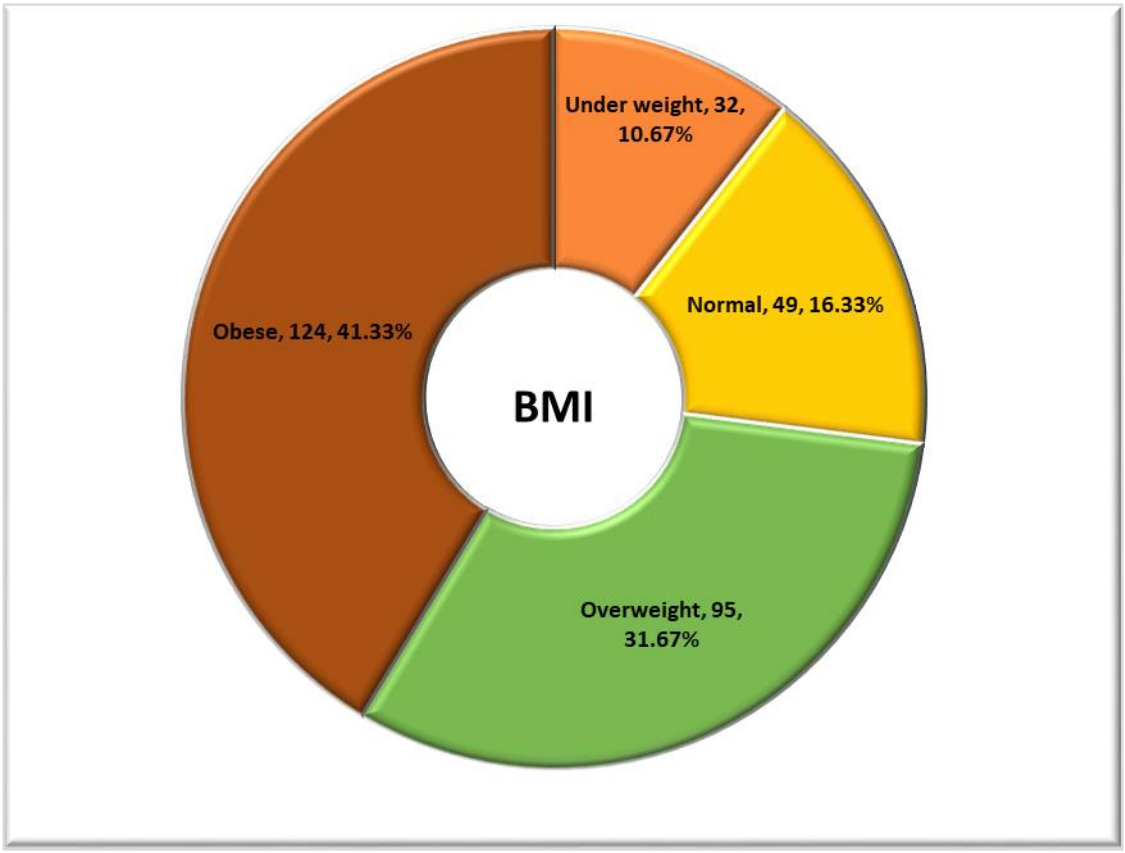

Table 2 Distribution of the habitual factors associated of the studied participated

	N	%
How many hours of sleep per day?		
<8	126	42.0
>=8	174	58.0
How many hours of watching TV per day?		
No	10	3.3
1-3hs.	32	10.7
3-5hs.	115	38.3
>5hrs	143	47.7
How many years do you suffer from diabetes?		
Less than one year	55	18.3
1-5years	68	22.7
5-10years	89	29.7
More than or equal ten year	88	29.3
What type of treatment do you use for diabetes?		
Tablets	99	33.0
Tablets with insulin	111	37.0

Insulin	90	30.0
Do you have any complications from diabetes?		
Yes	102	34.0
No	198	66.0
Physical activities or exercise		
No	118	39.3
Yes	182	60.7
Eating a portion of fruit		
Never	69	23.0
Daily	87	29.0
Weekly	90	30.0
Monthly	54	18.0
Eating a portion of vegetables		
Never	106	35.3
Daily	56	18.7
Weekly	59	19.7
Monthly	79	26.3
Breakfast daily		
Never	38	12.7
Daily	88	29.3
Weekly	122	40.7
Monthly	52	17.3
Drink soft drink daily		
Never	32	10.7
Daily	178	59.3
Weekly	90	30.0
Chronic disease		
Asthma	37	12.3
High blood pressure	63	21.0
High fat and cholesterol	77	25.7
Heart diseases	111	37.0
Arthritis or other rheumatic diseases	12	4.0

A considerable proportion of the respondents (58.0%) reported an average sleeping for more than >8hours/day follow by <8were (42.0%), regarding the how many hours of watching TV per day almost of the participants (47.7%) reported watching TV in the >5hrs, follow by 3-5hs were(38.3%), regarding the how many years do you suffer from diabetes most of participants 5-10years were (29.7%) follow by more than or equal ten year were(29.3%), regarding the what type of treatment do you use for diabetes most of participant tablets with insulin were (37.0%) follow by tablets were(29.3%), regarding the do you have any complications from diabetes most of participants answer No(66.0%), follow by Yes were(34.0%). More than half of the participants (60.7%) answer Yes practice Physical activities or exercise physical follow by No were(39.3%), regarding the eating a portion of

fruit almost of the participants were (30.0%) reported Weekly follow by daily were(29.0%), regarding eating a portion of vegetables most of participants never were (35.3%) follow by monthly were(29.3%), regarding the breakfast daily most of participants weekly were (40.7%) follow by daily were(29.3%), regarding the drink soft drink daily most of participants daily were (59.3%), follow by weekly were(30.0%) , regarding the breakfast daily most of participants weekly were (40.7%) follow by daily were(29.3%), regarding the Chronic disease most of participants heart diseases were (37.0%), follow by high fat and cholesterol were(25.7%).

Table 3 Distribution the relation between Socio-demographic factors associated with obesity among type II Diabetes patients

		N	BMI	F or T	ANOVA or T-test	
			Mean ± SD		Test value	P-value
Age	**<35**	163	31.039 ± 9.855	F	0.192	0.826
	35-50	88	31.127 ± 10.715			
	>50	49	32.062 ± 11.096			
Gender	**Female**	89	31.052 ± 10.576	T	-0.196	0.844
	Male	211	31.308 ± 10.195			
Marital status	**Single**	30	22.662 ± 4.778	F	8.430	<0.001*
	Married	186	32.393 ± 9.886			
	Divorced	39	32.232 ± 10.960			
	Widow	45	31.278 ± 11.553			
Level of education	**Non**	13	32.602 ± 10.228	F	0.422	0.833
	Primary education	31	29.462 ± 8.744			
	Lower secondary education	32	31.920 ± 12.839			
	Upper secondary education	58	31.199 ± 8.732			
	Post-secondary	37	32.689 ± 10.044			
	Tertiary education	129	30.946 ± 10.757			
Number of children	**One**	61	30.359 ± 10.898	F	1.308	0.272
	Two	63	32.317 ± 10.147			
	Three or more	146	32.890 ± 10.095			
Smoking	**Smoker**	156	26.585 ± 6.474	T	-9.210	<0.001*
	Non smoker	144	36.266 ± 11.269			

Regarding age, results show no significant relation between BMI and age were F=0.192 and P-value=0.826, increase (in >50years), the mean +SD were (32.062 ±11.096). Regarding gender show no significant relation between BMI and gender were T=-0.196 and P-value=0.844, increase in male the mean +SD were (31.308±10.195). Regarding marital status there is a significant relation between BMI and marital status were F=8.430 and P-

value= 0.001, increase (in widow), the mean +SD respectively were (31.278±11.553). Regarding Level of education there is no significant relation between BMI and Level of education were F=0.422 and P-value= 0.833, increase(Post-secondary), the mean +SD respectively were (32.689 ±10.044). Regarding Number of children there is no significant relation between BMI and Number of children were F=1.308 and P-value= 0.272, increase (Three or more), the mean±SD respectively were (32.890±10.095). Regarding Smoking there is a significant relation between BMI and Smoking Were T=-9.210 and P-value= 0.001, increase (Non smoker), the mean +SD respectively were (36.266±11.269)

Table 4 Distribution of the relation between habitual factors with obesity (BMI) among type II Diabetes patients

		N	BMI	F or T	ANOVA or T-test	
			Mean ± SD		Test value	P-value
hours of sleep per day	**<8**	126	26.841 ± 10.769	T	-6.740	<0.001*
	>=8	174	34.412 ± 8.664			
How many hours of watching TV per day?	**No**	10	26.077 ± 10.446	F	75.556	<0.001*
	1-3hs.	32	21.477 ± 8.608			
	3-5hs.	115	25.730 ± 7.083			
	>5hrs	143	38.200 ± 7.934			
How many years do you suffer from diabetes?	**Less than one year**	55	23.009 ± 4.347	F	115.612	<0.001*
	1-5years	68	26.918 ± 4.195			
	5-10years	89	28.369 ± 9.111			
	More than or equal ten year	88	42.601 ± 7.641			
What type of treatment do you use for diabetes?	**Tablets**	99	26.338 ± 10.223	F	29.570	<0.001*
	Tablets with insulin	111	31.008 ± 8.187			
	Insulin	90	36.891 ± 9.943			
complications from diabetes	**Yes**	102	42.016 ± 6.545	T	19.770	<0.001*
	No	198	25.677 ± 6.899			
Physical activities or exercise	**No**	118	41.095 ± 6.645	T	21.026	<0.001*

	Yes	182	24.837 ± 6.475			
Eating a portion of fruit	**Never**	69	45.564 ± 3.543	F	587.680	<0.001*
	Daily	87	26.362 ± 2.124			
	Weekly	90	33.316 ± 5.444			
	Monthly	54	17.292 ± 3.566			
Eating a portion of vegetables	**Never**	106	42.705 ± 5.431	F	430.959	<0.001*
	Daily	56	29.991 ± 4.524			
	Weekly	59	27.549 ± 1.808			
	Monthly	79	19.468 ± 4.368			
Breakfast daily	**Never**	38	16.877 ± 4.521	F	707.555	<0.001*
	Daily	88	44.632 ± 3.508			
	Weekly	122	29.722 ± 3.758			
	Monthly	52	22.587 ± 2.583			
Drink soft drink daily	**Never**	32	48.317 ± 2.703	F	312.502	<0.001*
	Daily	178	33.750 ± 6.791			
	Weekly	90	20.176 ± 4.513			
Chronic disease	**Asthma**	37	45.113 ± 3.872	F	77.057	<0.001*
	High blood pressure	63	30.702 ± 5.401			
	High fat and cholesterol	77	35.935 ± 7.688			
	Heart diseases	111	25.556 ± 8.859			
	Arthritis or other rheumatic diseases	12	13.534 ± 1.193			

Regarding hours of sleep per day, results show a significant relation between BMI and hours of sleep per day were T=-6.740and P-value=0.001, increase (in >8), the mean +SD were (34.412 ±8.664). Regarding how many hours of watching TV per day, results show a significant relation between BMI and how many hours of watching TV per day were F=75.556 and P-value=0.001, increase (in >5hrs), the mean +SD were (38.200 ±7.934). Regarding how many years do you suffer from diabetes, results show a significant relation between BMI and how many years do you suffer from diabetes were F=115.612 and P-value=0.001, increase (More than or equal ten year), the mean +SD were (42.601 ±7.641).

Regarding what type of treatment do you use for diabetes, results show a significant relation between BMI and what type of treatment do you use for diabetes were F=29.570 and

P-value=0.001, increase (Insulin), the mean +SD were (36.891 ± 9.943). Regarding complications from diabetes, results show a significant relation between BMI and complications from diabetes were T=19.770 and P-value=0.001, increase (Yes), the mean +SD were (42.016±6.545). Regarding Physical activities or exercise, results show a significant relation between BMI and Physical activities or exercise were T=21.026 and P-value=0.001, increase (Yes), the mean +SD were (41.095 ±6.645). Regarding Eating a portion of fruit, results show a significant relation between BMI and Eating a portion of fruit were F=587.680 and P-value=0.001, increase (Never), the mean +SD were (45.564±3.543). Regarding Eating a portion of vegetables, results show a significant relation between BMI and Eating a portion of vegetables were F=430.959and P-value=0.001, increase (Never), the mean +SD were (42.705±5.431). Regarding breakfast daily, results show a significant relation between BMI and Breakfast daily were F=707.555 and P-value=0.001, increase (Daily), the mean +SD were (44.632±3.508). Regarding drink soft drink daily, results show a significant relation between BMI and drink soft drink daily were F=312.502 and P-value=0.001, increase (never), the mean +SD were (48.317 ± 2.703). Regarding Chronic disease, results show a significant relation between BMI and Chronic disease were F=77.057and P-value=0.001, increase (Asthma), the mean +SD were (45.113±3.872).

8. DISCUSSION

The present study aimed to assess the effect of obesity and its associated risk factors on patients with type 2 diabetes who attend in primary health care center in Makkah al-Mokarramah 2021. The distribution of the study participants was the total number of participants 300 were males and female, such that most of them were (54.3%)in the <30 years followed by 39-50 years were(29.3%) which shows that T2DM was more prevalent among the age group of 30–50 years. This observation was similar to the WHO report which predicts that in KSA , India other developing countries, the highest increase would occur in the age group of 41–60 years.[25] The participated male were (70.3%), follow by female were(29.7 %) in this study, also gender show no significant relation between BMI and gender were T=-0.196 and P-value=0.844, increase in male the mean +SD were (31.308±10.195).This observation was similar to a study conducted by Bilal Wani et al. who reported that prevalence of diabetes among women was higher than in men with the ratio of 1.41:1.[26] In the current study, almost two-thirds of the type 2 diabetic patients (73.0%) were obese and overweight. This figure is higher than those reported in other similar studies carried out either locally or internationally. In Aseer region [27] . In Al-Khobar region [28] . In Jeddah [29]. In Yemen. In Tanzania [17]. In the United Kingdom [28] . The high prevalence of obesity among type 2 diabetic patients is explained by the fact that obesity is strongly associated with insulin resistance, which, if associated with insulin deficiency, leads to overt type 2 diabetes mellitus [30]. This higher prevalence of obesity among type 2 diabetic patients in the present study over most of other similar studies necessitates greater efforts from responsible authorities to investigate the problem and find possible solutions. The prevalence of based on BMI. in our study the BMI of the study participants was (73.0%) were obese and overweight. Study conducted in Warangal reported 59.2% of overweight and obese which is in par with our study.[15] Another study conducted in Bangalore reported 73% obesity with the mean BMI 26 Kg/m2.[17] Similar observation to our study was made in

a study conducted by Shyaminda Kahandawa et al. reported the mean BMI of 26.4 Kg/m2.[31] The magnitude of the problem of obesity and its influence on patients with type 2 with diabetes has not attracted enough attention, and relatively few obese diabetic patients are offered the option of weight management as an integral part of their management [21]

Similar observation to our study was made in a study conducted by Shyaminda Kahandawa et al. reported the mean BMI of 26.4 Kg/m2.[31]. In the present study, there was no significant difference between male and female type 2 diabetic patients regarding prevalence of obesity. In another study carried out in Jeddah [28], prevalence of obesity was higher in female than male patients. Also in Yemen, the prevalence of obesity among male patients was 11% whereas it was 32% among female patients [23]. In Tanzania, female diabetic patients were at almost 5-folds higher risk of overweight/obesity compared to male patients [29]. Regarding marital status there is a significant relation between BMI and marital status were F=8.430 and P-value= 0.001, increase (in widow), the mean +SD respectively were (31.278±11.553). Another Saudi study carried out in Jeddah housewives were at higher risk for obesity compared to others this could be attributed to their relatively less movement and being at home most of the time. [32] Lack of physical activity was associated with higher rate of obesity as participants who didn`t stop aerobic exercise for two consecutive days or more per week were at lower risk for obesity compared to those did that always. This is confirmed in many other studies [30] In this study, poor dietary habit manifested by never eating fruits was associated with obesity in bivariate analysis. However, after controlling for confounders in multivariate analysis, this effect disappeared. In another Saudi study, obesity was associated with physical inactivity and unhealthy dietary habits [29]. Lifestyle intervention approaches including physical activity and dietary habits have proven to be effective in controlled trials in reducing burden of both obesity and type 2 diabetes [26] , the current study revealed that type 2 diabetic patients who treated with insulin were at higher significant risk for obesity compared to those treated with tables. Insulin therapy is usually given to type 2 diabetic patients with poor glycemic control. In a study carried out in Aseer region, poor diabetic control significantly association with obesity [29]

CONCLUSION:

The prevalence of obesity in KSA is greater than the global prevalence of obesity, and risk factors are multifactorial. Three intervention approaches are commonly used to treat obesity; Obesity is highly prevalent among type 2 diabetic patients. Divorced, , patients who stopped aerobic exercise for two consecutive days or more per week as well as those treated with insulin were more likely to be obese. Policymakers, public health professionals, and practitioners engaged in public health and clinical management of obesity are encouraged to use findings to expedite nationwide reductions in the prevalence of obesity in KSA.

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