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REVIEW ARTICLE

Biochemical indices in Diabetic patients with Over-weight and Obesity at Al-Diwaniyah Governorate

Noora Flayyih Flek [1], Majid Abdulwahab Maatook [1], Aqeel Raheem Hassan[2]

1 Department of Community Health,Techniques / College of Health and,Medical Techniques/ SouthernTechnical University,Basra/ Iraq

2 Department of Medicine, College of Medicine, University of Al-Qadisiyah, Iraq

Corresponding author: E-mail : alzamlynoor87@gmail.com

Abstract:

Background: The World Health Organization (WHO) explains that "the fundamental cause of overweight and obesity is an energy imbalance between calories consumed and calories expended" and defines overweight and obesity as "abnormal or excessive fat accumulation that may impair health."

Aim of study: The study aims to determine the link between diabetes and certain biochemical indicators in order to evaluate the metabolic characteristics of the adult population with diabetes.

Methods: A convenient sample of 123 individuals who have diabetes type 2 was examined by an internal consultant and the Specialized Center for Diabetes and Endocrinology (SCDE) at Al-Diwaniyah Teaching Hospital as the elements for this observational cross-sectional study. A number of questions were collected during interviews and evaluated by a variety of experts; the questionnaire was designed by the researcher. The information was gathered between September 10th and the 1st of February.

Results: Among the 123 patients who participated in the study, there was a significant variation among study groups according to residence and marital status ($p = 0.002$, $p = 0.008$, respectively). The prevalence rate of overweight or obesity was 85.4%, and the normal weight was 14.6%. A significant beneficial relationship was discovered. between FBS and each of HbA1C and LDL-C ($r = 0.482$, $p<0.001$) ($r = 0.182$, $p = 0.044$), respectively.

Conclusion: This study observed that obese females suffering from diabetes were more likely than males. Also, there was a significant positive correlation between body mass index (BMI) and triglyceride (TG). The middle-aged patients with diabetes had a higher impact from obesity and overweight than older people.

Keywords: Biochemical indices, Overweight and obesity Type 2 diabetes, cardiovascular diseases, Al-diwaniya province.

Introduction

The World Health Organization (WHO) explains that "the fundamental cause of overweight and obesity is an energy imbalance between calories consumed and calories expended" and defines overweight and obesity as "abnormal or excessive fat accumulation that may impair health" (1). Typically, overweight and obesity develop during the period between adolescence and youth and persists throughout older years (2). As a result, obesity has a negative impact on population morbidity and mortality and places a significant burden on the health of nations and regions (3).

In addition to other serious diseases and conditions, poorly controlled diabetes can lead to death, deafness, kidney failure, dementia, coronary artery disease, strokes, peripheral artery disorders, and neuropathy (4). According to Zheng et al. (2018) (5), those with diabetes who do not receive treatment are at a higher risk of developing complications from the condition, which may appear years before an official diagnosis.

Obesity and being overweight provide a serious risk for diabetes mellitus type 2 (T2DM). According to the American Diabetes Association guidelines and the American Obesity Association, which include lifestyle modifications, pharmaceutical therapies, and surgical issues, these should be followed while managing obesity in people with T2DM. A treatment protocol for metabolic, hyperglycemia, and obesity patients undergoing bariatric surgery was created by the organizers of the Second Diabetes Surgery Summit, an international consensus meeting, in 2016 (6).

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The most important global health concern of this century is the rise of non-communicable diseases (NCDs). About 15 million of the 41 million fatalities attributed to NCDs each year are thought to be premature deaths, with most of them taking place in the age range of 30 to 69. This information is estimated by WHO. Diet-related non-communicable diseases (DR-NCDs) include high blood pressure (hypertension), diabetes mellitus, and certain types of cancer. These NCDs account for the majority of premature NCD deaths worldwide (7).

MATERIALS AND METHODS

A convenient sample of 123 individuals who have diabetes type 2 was examined by an internal consultant and the Specialized Center for Diabetes and Endocrinology (SCDE) at Al-Diwaniyah Teaching Hospital throughout the duration of the research period. In order to accomplish the present research's objectives, an observational, cross-sectional study was selected. Anyone over the age of 18, regardless of sex, was included in the study if they met the specified inclusion and exclusion criteria. All adult patients who took part in this study had their data collected between September 10, 2023, and the first of February 2024, with an average of five months spent on the data collection.

Socio-demographic characteristics

The study's general participant data consisted of the following: residence (rural or urban), sex (male or female), and age (in years). The four groups (illiterate, primary, secondary, and tertiary) were chosen based on educational level. Occupation was categorized into four groups (employed, self-employed, retired, and housewife) and marital status (single, married, divorced, or widow).

Biochemical measurement

Blood glucose

To monitor blood sugar levels, it was recommended that each participant avoid eating or drinking for at least 8 to 10 hours the night before. We adhered to the guidelines put forth by the American Diabetes Association (ADA), which classify an individual as having diabetes mellitus (DM) if their FBG level is 126 mg/dl or more, if their HbA1c value is 6.5% or above, and if they are currently on prescription medication for the disease. Normoglycemia was detected when the FBG level was less than 100 mg/dl and the glycated hemoglobin (HbA1c) value was less than 6.5%. Prediabetes was found when the fasting blood glucose level (FBG) was between 100 and 125 mg/dl and the HbA1c value was between 5.7% and 6.4%.

Lipid profile

Every study participant had their fasting lipid profiles (TG, total cholesterol, HDL, VLDL, and LDL) evaluated. Lipid profiles were evaluated in compliance with the standards established by the AHA and IDF.

Renal function test (RFT)

All of the participants underwent a renal function test to make sure they were not suffering from renal failure (RF) or chronic kidney disease (CKD). Serum creatinine and blood urea are tested in this procedure. The normal values of these parameters include: serum urea: 15 to 40 mg/dl; serum creatinine: 0.6 to 1.2 mg/dl in males; and 0.5 to 1.1 mg/dl in females(8).

Statistical analysis

Microsoft Office Excel 2010 and the statistical package for social sciences (SPSS) version 23 were utilized for collecting data, summarization, analysis, and presentation. Quantitative (categorical) variables were expressed using percentages and numbers, whereas the test known as Kolmogorov-Smirnov was employed to check if quantitative (numeric) variables had a normal distribution. As a result, normally distributed numeric variables were expressed as range, mean (an index of central tendency), and standard deviation (an index of dispersion).

We employed the chi-square test and one-way analysis of variance (ANOVA).

RESULTS

1. Sociodemographic characteristics among study group

The study found that the proportion of patients living in urban (81.3%) greater than those who living in rural area (18.7%), There was a significant variation among residence and study group (p=0.002). With respect to marital status there was also a significant difference among study (p=0.008). Regarding sex, education level, occupation and economic status there was no discernible variation (p > 0.5).

		Groups						P. value
		Normal weight		Overweight/ obesity		Total		
		No.	%	No.	%	No.	%	
Sex	Male	8	44.4	44	41.9	52	42.3	0.840
	Female	10	55.6	61	58.1	71	57.7	
Residence	Urban	10	55.6	90	85.7	100	81.3	0.002**
	Rural	8	44.4	15	14.3	23	18.7	
Education level	Illiterate	5	27.8	18	17.1	23	18.7	0.089
	Primary	11	61.1	43	41.0	54	43.9	
	Secondary	1	5.6	34	32.4	35	28.5	
	Tertiary	1	5.6	10	9.5	11	8.9	
Occupation	Employee	2	11.1	14	13.3	16	13.0	0.892
	Self-employee	3	16.7	23	21.9	26	21.1	
	Housewife	10	55.6	56	53.3	66	53.7	
	Retired	3	16.7	12	11.4	15	12.2	
Marital status	Single	0	.0	1	1.0	1	.8	0.008**
	Married	12	66.7	96	91.4	108	87.8	
	Divorced	0	.0	1	1.0	1	.8	
	Widow	6	33.3	7	6.7	13	10.6	
Economic status	Low	14	77.8	78	74.3	92	74.8	0.844
	Middle	3	16.7	23	21.9	26	21.1	
	High	1	5.6	4	3.8	5	4.1	

**: significant at p ≤ 0.01

2. Prevalence rate of overweight and obesity among study group

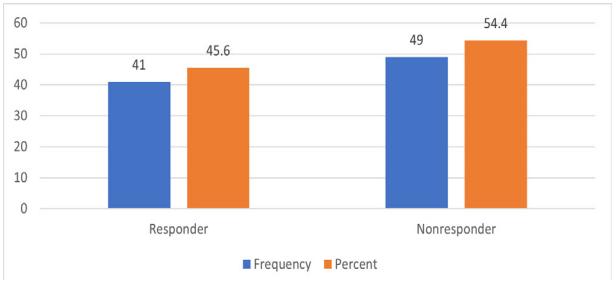
The current study consists of 123 patients diagnosed with T2DM. Among them, the prevalence rate of overweight or obesity was 85.4%, and normal weight accounted for 14.6%.

Figure 1. Pie chart showing the categorization of patients according to body mass index

3.Distribution of the study sample according to age groups

Respect to age groups, there was no significant difference among diabetic patient who are overweight or obese with normal weight (p=0.868).

Figure 2: Distribution of the study sample by age



4. Correlation among variables in diabetes mellitus

There was significant positive correlation between body mass index (BMI) and triglyceride (TG) (r = 0.238, p = 0.008). There was also significant beneficial connection among SBP and DBP (r=0.575, p<0.001) but negative with HDL-C (r = -0.200, p = 0.027). As well as, there was significant positive correlation between FBS with each of HbA1C and LDL-C (r = 0.482, p < 0.001) (r = 0.182, p = 0.044) respectively. A strong beneficial correlation was observed among LDL-C with each of VLDL-C, cholesterol and TG (r = 0.704, p < 0.001) (r = 0.888, p < 0.001) (r = 0.219, p = 0.015) respectively. There was significant negative correlation between HDL-C with each of VLDL-C, cholesterol and blood urea (r = -0.200, p = 0.027) (r = -0.310, p .= <0.001) (r = -0.181, p = 0.045) respectively

DISCUSSION

1.Sociodemographic characteristics among study group

According to the current study, the distribution of sex showed that most participants were female and that there was no significant difference between the study groups (p = 0.233). Moradi-Lakeh et al. (2015) (9), discovered that Saudi Arabian women participants self-reported poorer or fairer health than adult males, even with the findings of Shivpuri et al. (2012) (10), and Ishii et al. (2012) (11), that subjects who were female were more vulnerable to inflammation, which could lead them to have a greater likelihood of developing metabolic syndrome and diabetes. According to research by Abdeen et al. (2012) (12), female participants in Palestine had twice the rate of obesity as male subjects. This shows that the prevalence of obesity among women may raise their risk of illness.

This present investigation found no significant variation between education level and diabetes. These results are consistent with another study made in Saudi Arabia by Al-Rasheedi (2014) (13), which found that glycemic control was not influenced by level of education.

According to marital status, we found that the most affected patients with diabetes were married, and the association between diabetes mellitus and marital status was statistically significant. (p = 0.008). Findings from this investigation agree with de Oliveira et al. (2020) (15), who found the same results.

In this study, we found that the prevalence of T2DM was significantly higher among patients who live in urban areas than those who live in rural areas. These findings agreed with the study conducted by Nosratzehi et al. (2021) (6), which found the same results.

2.Prevalence rate of overweight and obesity among study group

According to this study, the prevalence of obesity and overweight represents about 85.4%, while the prevalence of normal weight accounts for 14.6%. These findings agree with the study conducted by AlShahrani (2021) (16), which revealed that the prevalence of obesity and overweight among diabetic patients accounts for 85.8%, while the normal weight is 13.2%.

3.Distribution of the study sample according to age groups

In this study, although there was not a significant variation according to age group, results found that the effect of obesity and overweight in patients with diabetes is greater for middle-aged adults than for older adults. This study is consistent with other study conducted by Sasai et al. (2010) (17).

4.Correlation among variables in diabetes mellitus

There was a significant positive correlation between body mass index (BMI) and triglyceride (TG). These results are consistent with the study findings done by Jiang et al. (2021) (18), who reported that the risk of pre-diabetes related to TyG-BMI was

substantially greater among people less than fifty years old (P-value<0.05). Additionally, among DM patients, there was a significant beneficial relationship between SBP and DBP. These results agreed with the study findings done by Prabodh et al. (2012) (19), which found a positive correlation with SBP and DBP in patients with DM. In this study, there was a significant positive correlation between LDL and HbA1C. The results of this study are supported by Prabhavathi et al. (2014) (20), who reported that HbA1c showed direct and significant correlations with LDL. The present results reveal that there was a significant positive correlation between LDL-C and each of VLDL-C, cholesterol, and TG. These results are in line with Dixit et al. (2014) (21) which found similar outcomes. Also, a research study conducted by Kashinakunti et al. (2017) (22) found that lipid profiles were raised significantly in T2DM patients. The results of this study indicate that there was a significant negative correlation between HDL-C and each of VLDL-C, cholesterol, and blood urea. These results are similar to those of Kashinakunti et al. (2017) (Wang et al. 2023) (22) (23), who revealed that serum HDL-C was significantly negatively correlated with other lipid profiles and blood urea (P value<0.05).

CONCLUSION

1. The study showed that obese and overweight diabetic females were higher than males. Also, apparently, there was a significant association between diabetes and marital status.
2. According to the findings, the prevalence rate of obesity and overweight is higher than normal weight among diabetic patients.
3. There was a strong positive correlation between triglycerides (TG) and body mass index (BMI). Also, between LDL-C and TG, VLDL-C, and cholesterol, Additionally, among DM patients, there was a substantial relationship between SBP and DBP, but there was a substantial inverse relationship between HDL-C and blood urea, cholesterol, and VLDL-C.
4. The findings demonstrated that middle-aged patients with diabetes had a higher impact from obesity and overweight than older people.

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Table 2: Correlations among variables in diabetes mellitus

Characteristic		SBP (mmHg)	DBP (mmHg)	FBG (mg/dl)	HbA1C%	LDL	HDL	VLDL	Cholesterol	TG	Blood urea	Serum creatinine
Body mass index	r	0.041	0.136	-0.035	-0.071	-0.008	-0.094	0.027	-0.048	0.238**	-0.089	0.140
	P	0.656	0.133	0.697	0.438	0.928	0.303	0.767	0.6	0.008	0.329	0.122
SBP (mmHg)	r		0.575***	-0.156	-0.071	-0.089	-0.200*	-0.051	-0.129	0.005	-0.048	0.052
	P		<0.001	0.085	0.437	0.328	0.027	0.578	0.153	0.958	0.596	0.569
DBP (mmHg)	r			-0.007	-0.026	-0.144	-0.165	-0.045	-0.166	0.079	-0.03	-0.112
	P			0.937	0.776	0.112	0.068	0.618	0.066	0.386	0.746	0.219
FBS (mg/dl)	r				0.482***	0.182*	-0.129	0.096	0.135	0.135	-0.119	-0.100
	P				<0.001	0.044	0.156	0.293	0.138	0.136	0.191	0.272
HbA1C%	r					0.158	0.028	0.077	0.143	0.043	-0.086	-0.002
	P					0.081	0.76	0.396	0.116	0.633	0.343	0.985
LDL	r						0.056	0.704***	0.888***	0.219*	0.119	0.026
	P						0.538	<0.001	<0.001	0.015	0.19	0.778
HDL	r							-0.200*	-0.310***	-0.018	-0.039	-0.181*
	P							0.027	<0.001	0.841	0.665	0.045
VLDL	r								.800***	0.193*	0.137	0.066
	P								<0.001	0.033	0.130	0.469
Cholesterol	r									0.210*	0.178*	0.028
	P									0.020	0.049	0.758
TG	r										0.061	0.198*
	P										0.505	0.028
Blood urea	r											0.346***
	P											<0.001

*: significant at p ≤ 0.05; **: significant at p ≤ 0.01; ***: significant at p ≤ 0.001