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Relationship between Dyslipidemia and Hyperglycemia in Obese Patients

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Abstract: Obesity occurs because of the accumulation of fat in the body and can occur due to high cholesterol so that it can interfere with health. This study aims to provide an overview of triglycerides (S.TG), cholesterol (S.TC), fasting blood sugars (FBG) and glycated hemoglobin (HbA1c) in obese patients. This method is by calculating the Body Mass Index (BMI), S.TG, S.TC, FBG and HbA1c examination. The data obtained were then analyzed descriptively. Based on this research, it was found that most obese patients had high cholesterol levels (101-256 mg/dL) while overweight patients showed moderate cholesterol levels (135-210 mg/dL). In addition, upon triglyceride examination the majority overweight patients still had normal levels (<150 mg/dL) while the obese patients showed high levels (88-300 mg/dl). Moreover, the obese patients manifested high glucose levels (84-413 mg /dl) as well as overweight patients (300-380 mg/dl). Finally, it was found that the obese patients had high glycated hemoglobin (HbA1c) levels (6.10-13.8) as well as overweight patients (9.60-14.0).

Keywords: Obesity, Overweight, Triglycerides, Cholesterol, Fasting Blood Glucose, HbA1c.

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INTRODUCTION

Obesity can occur because the energy intake that enters the body is greater than the energy expended. So that excess energy will be stored as fat in the cells, and can cause weight gain [1]. Obesity is considered as one of the factors that can increase the prevalence of hypertension, glucose intolerance, and atherosclerotic coronary heart disease in obese patients [2-4]. Obesity can occur because of high cholesterol which is considered bad for health. The types of cholesterol in our body are LDL (Low Density Lipoprotein) which can stick to blood vessels and HDL (High Density Lipoprotein) which is fat that can dissolve LDL content in the body. While the total amount of cholesterol in the body is called total cholesterol [5]. Obesity has a close relationship with the high incidence of cardiovascular disease. Body metabolism and heart performance will be disrupted when LDL levels in the body's blood are more than HDL levels. HDL referred to as the good fat, because it cleans LDL-cholesterol from the walls of blood vessels by transporting it back to the liver [6,7]. HbA1c was used as an indicator of glycemic control in most previous studies. HbA1c was a stable indicator of glycemic control, which reflected an average glycemic level of about three months and did not show glycemic variability over a period of time. Fasting blood glucose (FBG) is an economical and important indicator for the diagnosis and glycemic variability. Few studies have shown the relationship between glycemic profile (FBG, HbA1c) control and lipid profiles (S.TG, S.TC) [8-10]. In addition these studies confirmed the relationship between glycemic control and lipid profiles in patients, their results are quite inconsistent [11-14]. Therefore, this study aims to assess the levels of lipid profiles (S.TG, S.TC) and glycemic profile (FBG and HbA1c) and investigate the relationship between glycemic profile control and lipid profile in overweight and obese patients.

RESEARCH METHODS

This study aims to provide an overview of S.TG, S.TC, FBG, and HbA1c in obese patients. The sample of this study was 50 respondents consisting of men and women aged 50 to 65 years who have obesity with BMI 30 Kg/m².The procedures of this research include: (1) Body Mass Index (BMI) calculation by measuring height, body weight, then calculating the BMI formula; (2) S.TG, S.TC measurement and (3) FBG, and HbA1c measurement. The data obtained were then analyzed descriptively.

RESULTS

Table (1): Distribution of the studied cases according to BMI (n=50)

	No.	%
BMI (kg/m^2)		
25 – 29.9 (overweight)	4	8.0
>30 (obese)	46	92.0

The distribution of lipid profile in overweight and obese patients is listed on tables below.

Table (2): Relation between BMI and S. Cholesterol

S. Cholesterol (mg /dl)	BMI (kg/m^2)				Test of sig.	P
	25 – 29.9 (overweight) (n=3)		>30 (obese) (n=21)			
	No.	%	No.	%		
≤ 200 (Normal)	2	66.7	14	66.7	χ^2=	FEp=
> 200 (Abnormal)	1	33.3	7	33.3	0.0	1.000
Min. – Max.	135.0 – 210.0		101.0 – 256.0		t=	0.876
Mean ± SD.	166.0 ± 39.15		170.41 ± 45.67		0.158	
Median (IQR)	153.0 (144.0 – 181.5)		175.0 (128.0 – 209.0)			

IQR: **Inter quartile range** SD: **Standard deviation**
χ^2: Chi square test FE**: Fisher Exact** **t: Student t-test**
p: p value for comparing between **the studied BMI groups**

Table (3): Relation between BMI and S.TG

S.TG (mg /dl)	BMI (kg/m^2)				Test of sig.	P
	25 – 29.9 (overweight) (n=2)		>30 (obese) (n=17)			
	No.	%	No.	%		
≤ 150 (Normal)	2	100.0	8	47.1	χ^2=	FEp=
>150 (Abnormal)	0	0.0	9	52.9	2.012	0.474
Min. – Max.	88.0 – 138.0		32.0 – 300.0		t=	0.561
Mean ± SD.	113.0 ± 35.36		146.31 ± 76.87		0.594	
Median (IQR)	113.0 (88.0 – 138.0)		154.0 (95.0 – 193.0)			

IQR: **Inter quartile range** SD: **Standard deviation**
χ^2: Chi square test FE**: Fisher Exact** **t: Student t-test**
p: p value for comparing between **the studied BMI groups**

The distribution of glycaemia profile in overweight and obese patients is listed on tables below.

Table (2): Relation between BMI and FBS

FBS (mg /dl)	BMI (kg/m^2)				Test of sig.	P
	25 – 29.9 (overweight) (n=4)		>30 (obese) (n=45)			
	No.	%	No.	%		
≤ 126 (Normal)	0	0.0	10	22.2	χ^2=	FEp=
>126 (Abnormal)	4	100.0	35	77.8		0.569
Min. – Max.	300.0 – 380.0		84.0 – 413.0		t=	0.002*
Mean ± SD.	330.0 ± 38.30		198.20 ± 80.82		3.206*	
Median (IQR)	320.0 (300.0–360.0)		188.0 (130.0–254.0)			

IQR: **Inter quartile range** SD: **Standard deviation**
χ^2: Chi square test FE**: Fisher Exact** **t: Student t-test**
p: p value for comparing between **the studied BMI groups**
*: Statistically significant at p ≤ 0.05

Table (3): Relation between BMI and HbA1C %

HbA1C (%)	BMI (kg/m^2)				Test of sig.	P
	25 – 29.9 (overweight) (n=4)		>30 (obese) (n=44)			
	No.	%	No.	%		
≤ 6.5 (Normal)	0	0.0	5	11.4		^{FE}p= 1.000
> 6.5 (Abnormal)	4	100.0	39	88.6		
Min. – Max.	9.60 – 14.0		6.10 – 138.00		U= 22.50*	0.010*
Mean ± SD.	12.78 ± 2.13		12.22 ± 19.52			
Median (IQR)	13.75 (11.55 – 14.0)		9.10 (7.50 – 11.20)			

IQR: **Inter quartile range** SD: **Standard deviation**

χ^2**: Chi square test** FE**: Fisher Exact** **U: Mann Whitney test**

p: p value for comparing between **the studied BMI groups**

*: Statistically significant at p ≤ 0.05

DISCUSSION

On examination of cholesterol levels, it was found that most obese patients were known to have high cholesterol levels (101- 256 mg/dL) and with overweight patients moderate cholesterol levels (135-210 mg/dL). Triglyceride examination in overweight patients showed that the majority still had normal levels (<150 mg/dL). Triglyceride examination in obese patients showed that high levels (88-300 mg/dL). Our results manifested the association between obesity and serum cholesterol level and triglyceride level while it was weaker in upper age and less in young age. So it is recommended to establish an educational planning for controlling the obesity, cholesterol and triglycerides especially in early middle age.

On examination of fasting blood glucose levels, it was found that the obese patients were known to have high glucose levels (84-413 mg/dl) and in overweight patients (300-380 mg/dl).

On examination of glycated hemoglobin (HbA1C) levels, it was found that the obese patients were known to have high (HbA1C) levels (6.10- 13.8) and in overweight patients (9.60-14.0).

CONCLUSION

Hyperlipidemia and hyperglycemia is a major health problem in the east of Libya and obesity is associated with it. There is significant association between serum cholesterol level, triglycerides levels and hyperglycemia and obesity.

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