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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 develops when the energy consumed exceeds the energy the body uses. The surplus energy is stored as fat in cells, producing weight gain [1]. Obesity is a risk factor for higher rates of hypertension, glucose intolerance, and atherosclerotic coronary heart disease [2-4]. Elevated cholesterol contributes to obesity-related risk: low-density lipoprotein (LDL) tends to deposit on vessel walls, while high-density lipoprotein (HDL) helps remove LDL from those walls. The combined amount of all cholesterol types is referred to as total cholesterol [5].

There is a strong link between obesity and cardiovascular disease. When LDL levels exceed HDL, metabolic processes and heart function can be impaired. HDL is often called “good” cholesterol because it transports LDL-cholesterol away from blood vessel walls back to the liver for removal [6,7].

Glycemic indicators commonly used in research include hemoglobin A1c (HbA1c) and fasting blood glucose (FBG). HbA1c reflects average blood glucose over roughly three months and is a stable measure of long-term glycemic control, though it does not capture short-term glucose variability. FBG is a cost-effective measure useful for diagnosis and for assessing glycemic fluctuations. A limited number of studies have examined associations between glycemic measures (FBG, HbA1c) and lipid measures (serum triglycerides [S.TG], serum total cholesterol [S.TC) [8-10]. While those studies support a connection between glycemic control and lipid profiles, their findings are not entirely consistent.

Given these mixed results, this study aims to measure lipid profiles (S.TG, S.TC) and glycemic markers (FBG, HbA1c) in overweight and obese patients and to evaluate the relationship between glycemic control and lipid profile in this population [11-14].

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		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		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		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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