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The Risk of Cardiovascular Diseases and Obesity

Juljana Xhindoli¹, Lumturi Alushi²¹ Department of Health Care, Faculty of Health, University "Ismael Qemali", Vlorë, Albania² Vlora Regional HospitalCorresponding author: juljana.xhindoli@univlora.edu.al

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Abstract

More people die from cardiovascular diseases (CVDs) than from any other cause. Over three quarters of heart disease and stroke related deaths occur in low- and middle-income countries (WHO 2020). Obesity has emerged as one of the most important modifiable risk factors for cardiovascular disease. Aim is to verify the relationship between obesity and cardiovascular diseases through the analysis of blood biochemical indicators (total cholesterol, triglycerides, and glycemia), as well as to highlight the role of nursing care in primary health care.

This cross-sectional study included 199 patients' charts followed at Primary Health Care Center No. 4 in the city of Vlora. Data were analyzed according to age, sex, weight, height, smoking and alcohol consumption, as well as blood analysis indicators (glycemia, hypertension, and

triglycerides). Statistical analysis was performed using SPSS version 21. Absolute and relative frequencies (%) were used for qualitative variables, while means and standard deviations were calculated for quantitative variables. Group differences were tested using the chi-square test, with statistical significance set at $p < 0.05$. The mean age of participants was 53.7 years ($SD \pm 12.8$), with a minimum age of 35 years and a maximum of 83 years; the highest proportion belonged to the age group over 60 years (32%). The mean body mass index was $27.2 \pm 3.16 \text{ kg/m}^2$; 48.2% of patients had normal weight, 37.7% were overweight, and 13.1% were obese. A statistically significant association was found between obesity and elevated levels of cholesterol, triglycerides, and glycemia ($p < 0.05$). Obese patients showed a markedly higher probability of pathological triglyceride levels (OR=266), glycemia (OR=19.9 for diabetes), and cholesterol compared with pa-

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tients of normal weight. Higher levels of these indicators were also observed in patients over 60 years of age, smokers, and alcohol consumers. The study confirmed a strong and statistically significant association between obesity and the risk of developing cardiovascular diseases. Increasing BMI is associated with a substantial increase in the probability of hypercholesterolemia, hypertriglyceridemia, and glycemic disorders. These findings emphasize the importance of the nurse's role in primary health care for cardiovascular risk assessment, patient education, and the implementation of evidence-based preventive interventions.

Keywords: *Obesity, glycemia, hypercholesterolemia, hypertriglyceridemia, cardiovascular disease risk, nursing primary health care.*

Introduction

Cardiovascular diseases (CVDs) remain the leading cause of morbidity and mortality worldwide, accounting for approximately 32% of all global deaths (WHO, 2023). More people die from cardiovascular diseases (CVDs) than from any other cause. Over three quarters of heart disease and stroke related deaths occur in low- and middle-income countries (WHO 2020). Obesity has emerged as one of the most important modifiable risk factors for cardiovascular disease. Despite significant advances in prevention and treatment, the burden of CVDs continues to rise, particularly in low and middle-income countries, where demographic aging and lifestyle-related risk factors are increasingly prevalent (Roth et al., 2020).

Obesity has emerged as one of the most important modifiable risk factors for cardiovascular disease. Defined by an excessive accumulation of body fat, obesity is strongly associated with metabolic abnormalities such as dyslipidemia, insulin resistance, impaired glucose tolerance, and chronic low-grade inflammation, all of which contribute to the development and progression of atherosclerosis (Eckel et al., 2005; Grundy,

2016). Epidemiological evidence consistently demonstrates that individuals with obesity have a substantially higher risk of hypertension, type 2 diabetes mellitus, and coronary heart disease compared to individuals with normal body weight (Lavie et al., 2018).

Alterations in lipid metabolism, particularly elevated levels of total cholesterol and triglycerides, represent key pathways linking obesity to cardiovascular risk. Similarly, disturbances in glucose metabolism, including hyperglycemia and diabetes, further exacerbate endothelial dysfunction and vascular damage (Reaven, 2011). These metabolic derangements tend to worsen with increasing age and are often amplified by unhealthy lifestyle behaviors such as smoking and alcohol consumption (Ambrose & Barua, 2004; Rehm et al., 2017).

Primary health care plays a pivotal role in the prevention and early management of cardiovascular risk factors. Within this setting, nurses are uniquely positioned to conduct systematic risk assessment, monitor anthropometric and biochemical indicators, and deliver evidence-based health education aimed at lifestyle modification (Stanhope & Lancaster, 2020). Nurse-led interventions focusing on weight management, smoking cessation, and dietary counseling have been shown to effectively reduce cardiovascular risk and improve long-term health outcomes (Smith et al., 2016; Joo & Liu, 2021). Despite the growing international evidence, data examining the association between obesity and cardiovascular risk indicators in primary health care populations in Southeast Europe remain limited. Understanding these relationships at the local level is essential for developing targeted, nurse-led preventive strategies. Therefore, the present study aims to assess the relationship between obesity and key cardiovascular risk indicators-total cholesterol, triglycerides, and glycemia-and to highlight the role of nursing care in primary health care in the prevention of cardiovascular diseases.

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Methodology

This study was designed as a cross-sectional descriptive analysis and included 199 patients' charts at Primary Health Care Center No. 4 in the city of Vlora during 2024. In order to conduct this study, we had the ethical permission approved from the Faculty of Health and the Health Operator of Vlora District. We ensured the staff that the data collected would be confidential and used only for the purposes of the study, without revealing the identity of the patients. We worked with the patients' charts in the check-up area, where the data is current and detailed. Data were analyzed according to age, sex, weight, height, smoking and alcohol consumption, as well as blood analysis indicators (glycemia, total cholesterol, and triglycerides).

Statistical analysis was performed using SPSS version 21. Absolute and relative frequencies (%) were used for qualitative variables, while means and standard deviations were calculated for quantitative variables. Differences between

groups were tested using the chi-square test, with statistical significance set at $p < 0.05$. The association between blood analysis indicators (dependent variables) and obesity (based on BMI), as well as other influencing factors, was assessed using logistic regression analysis.

Results

Demographic and Anthropometric Characteristics

The mean age of the patients was 53.7 ± 12.8 years, with 32% of participants belonging to the age group over 60 years. Gender distribution was nearly equal, with 50.8% females and 49.2% males. The mean body mass index (BMI) was 27.2 ± 3.16 kg/cm². According to BMI classification we saw that 48.2% of the patients had normal weight, 37.7% were overweight, 13.1% were obese, 1.0% were underweight. The data is presented in Table 1.

Table 1. Patient characteristics

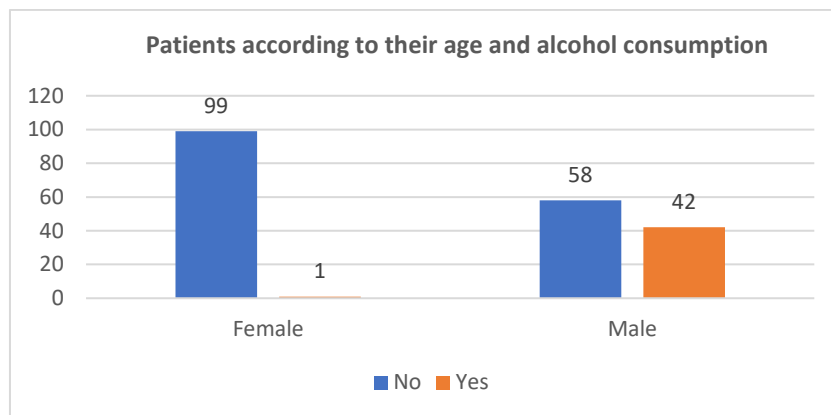
Characteristics	N	Minimum	Maximum	Mean	SD
Age	199	35	83	53.74	12.791
Weight	199	48	114	74.75	13.7
Height	199	153	190	170.21	8.626
BMI (kg/cm ²)	150	22.9	56.7	27.2	3.16

No statistically significant differences in BMI were observed according to age or gender ($p > 0.05$). The majority of patients did not consume alcohol (79%), while 21% did. No statistically significant differences were found between age groups regarding alcohol use. In contrast, a statistically significant difference was observed

between sexes in relation to alcohol consumption, with 40% of men reporting alcohol use compared to only 1% of women. This difference was statistically significant, as indicated by the chi-square test ($p = 0.000$; $p < 0.05$). Graph 1 presents this relation.

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Graph 1: The relation between gender and alcohol consumption



The data collected revealed that the majority of patients were smokers (55%). A statistically significant difference was observed between sexes with regard to smoking status, as indicated by the

chi-square test ($p=0.000$; $p<0.05$). Smoking prevalence was higher among men (75%) compared to women (34%). See Table 2 below.

Table 2. Distribution of patients according to smoking status and sex

Smokers	Sex		Total
	Women	Men	
NO	66	24	90
YES	34	75	109
Total	100	99	199

Biochemical Blood Indicators

The mean values of the analyzed biochemical indicators were:

- Total cholesterol: 218.6±46.7 mg/dl
- Triglycerides: 135.3±53.5 mg/dl
- Glycemia: 111.3±31.6 mg/dl

Table 3. Blood test results of the patients

Blood test	N	Minimum	Maximum	Means	Std. Deviation
Cholesterol (mg/dl)	199	130.5	330.0	218.6	46.7
Triglycerides (mg/dl)	199	53.5	280.6	135.3	53.5
Glycemia (mg/dl)	199	70.0	220.1	111.3	31.6

Table 4 presents the distribution of patients according to total cholesterol levels, based on the following classification:

- 145–220 mg/dl: Normal level
- 220–239 mg/dl: Upper borderline
- ≥240 mg/dl: High

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The majority of patients (55%) had total cholesterol levels within the normal range. Approximately 37% had high total cholesterol levels,

while 8% had cholesterol values within the upper borderline range.

Table 4. Distribution of patients according to total cholesterol levels

Cholesterol levels	Nr	%
High	73	36.7%
Upper borderline	16	8.0%
Normal level	110	55.3%
Total	199	100.0%

Table 5 presents the distribution of patients according to triglyceride levels, based on the following classification:

- 45–150 mg/dl: Normal
- 150–199 mg/dl: Upper borderline
- ≥200 mg/dl: High

From Table 5, it can be observed that 62.8% of patients had normal triglyceride levels. Approximately 16% had high triglyceride levels, while 22% had values within the upper borderline range.

Table 5. Distribution of patients according to triglyceride levels

Triglyceride levels	N	%
Upper borderline	43	21.6%
High	31	15.6%
Normal level	125	62.8%
Totali	199	100.0%

Table 6 presents the distribution of patients according to glycemia levels, based on the following classification:

- 70–115 mg/dl: Normal
- 115–125 mg/dl: Prediabetic
- ≥126 mg/dl: Diabetic

From Table 6, it can be observed that the majority of patients had normal glycemia levels. Approximately 9% of patients had prediabetic glycemia levels, while 23% were classified as diabetic.

Table 6. Distribution of patients according to glycemia levels

Glycemia levels	N	%
Diabetic	46	23.1%
Normal	135	67.8%
Prediabetic	18	9.0%
Total	199	100.0%

Overall, about 37% of patients had high total cholesterol, 16% had high triglyceride levels, and 3%

were classified as diabetic. The data indicate that men had higher levels of triglycerides and total

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cholesterol compared to women, whereas women exhibited higher glycemia levels compared to men.

Blood Indicators and Patient Age

Patients aged over 60 years presented higher levels of triglycerides, glycemia, and total cholesterol compared to other age groups. The highest

mean triglyceride value was observed in the over 60 years age group (149.5 mg/dl), while the highest mean glycemia value was also found in this age group (118.1 mg/dl). In contrast, the highest mean total cholesterol value was observed in the 50–60 years age group (229.7 mg/dl).

Table 7. Mean values of blood indicators according to age

Ages		Triglycerides	Glycemia	Cholesterol
≤40 years	Mean	116.22	101.313	199.418
	Std. Deviation	50.8517	28.37	48.3858
40-50 years	Mean	131.396	112.736	212.968
	Std. Deviation	54.1574	34.2464	46.2535
50-60 years	Mean	135.696	108.699	229.733
	Std. Deviation	50.1021	30.7627	46.3334
Over 60 years	Mean	149.524	118.089	225.978
	Std. Deviation	54.4945	31.1567	43.0308

Association Between Blood Indicators and Obesity

Obesity was associated with significantly higher levels of triglycerides, glycemia, and total cholesterol compared to other BMI groups ($p=0.000$). Obese patients exhibited a markedly higher prevalence of hypertriglyceridemia, with 92% having triglyceride levels above the normal range and 73% presenting high levels, compared with overweight patients (44% above normal) and patients with normal weight (15% above normal).

Similarly, obese patients showed higher glycemia levels, with 65% classified as diabetic, compared with overweight patients (25%) and those with normal weight (11%) ($p=0.000$). Regarding total cholesterol, all obese patients had values above the normal range, and 99% presented high cholesterol levels. This prevalence was lower among overweight patients (48% with high cholesterol levels) and among patients with normal weight (12%) ($p=0.000$).

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Table 8. Distribution of patients according to triglyceride, glycemia, and total cholesterol levels by obesity status

Triglyceride levels	Obesity				Total
	Under-weight	Normal	Over-weight	Obese	
Normal	2	82	39	2	125
Upper borderline	0	11	27	5	43
High	0	3	9	19	31
Total	2	96	75	26	199
Glycemia levels	Obesity				Total
	Under-weight	Normal	Over-weight	Obese	
Diabetic	0	10	19	17	46
Normal	2	80	46	7	135
Prediabetic	0	6	10	2	18
Total	2	96	75	26	199
Cholesterol levels	Obesity				Total
	Under-weight	Normal	Over-weight	Obese	
High	0	12	36	25	73
Upper borderline	0	4	11	1	16
Normal	2	80	28	0	110
Total	2	96	75	26	199

Regression analysis revealed a statistically significant association between obesity and all three blood analysis indicators ($p < 0.001$). Logistic regression analysis further demonstrated that:

- obese patients had a 266-fold higher probability of having high triglyceride levels compared to patients with normal body weight (Table 9).

- the probability of being diabetic was approximately 20 times higher, while the probability of being prediabetic was 4 times higher among obese patients.

- Furthermore, obese patients exhibited a very low probability of having normal total cholesterol levels, estimated at 1/1000, compared with patients of normal weight.

Table 9. Model Fitting Information

TR ^a	B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
Upper borderline	Intercept	-2.033	0.321	40.197	1	0		
	[Obese]	2.949	0.896	10.834	1	0.001	19.091	3.297 110.536
	Overweight]	1.665	0.407	16.755	1	0	5.287	2.382 11.734
	[Normal]	0 ^b	.	.	0	.	.	.
High	Intercept	-3.332	0.588	32.162	1	0		

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	[Obese]	5.583	0.948	34.722	1	0	266	41.526	1703.908
	Overweight]	1.866	0.694	7.223	1	0.007	6.462	1.657	25.193
	[Normal]	0 ^b	.	.	0

a. The reference category is: Normal.

Patients aged over 60 years exhibited higher levels of total cholesterol, triglycerides, and glycemia compared to other age groups ($p < 0.05$).

Other Influencing Factors: Association Between Blood Indicators, Alcohol Consumption, and Smoking

Smoking and alcohol consumption were associated with higher levels of total cholesterol and triglycerides, whereas the effect of smoking on glycemia was not statistically significant. Patients who consumed alcohol more frequently exhibited high total cholesterol levels compared with non-consumers (67% vs. 28%; $p = 0.000$), as well as higher glycemia levels (45% vs. 28%; $p = 0.024$) and elevated triglyceride levels (above normal 57% and high 28% vs. 30% and 12%; $p = 0.001$).

Similarly, smokers showed a higher prevalence of high total cholesterol (52% vs. 18%; $p = 0.000$) and increased triglyceride levels (above normal 48% and high 21% vs. 26% and 9%; $p = 0.010$) compared with non-smokers. No statistically significant differences in glycemia levels were observed according to smoking status ($p = 0.085$).

Discussion

The findings of this study confirm that obesity constitutes a major risk factor for the development of cardiometabolic disorders, being associated with significantly higher levels of total cholesterol, triglycerides, and glycemia. These results are consistent with international evidence identifying obesity as a key determinant of cardiovascular risk through mechanisms such as dyslipidemia, insulin resistance, and chronic low-grade inflammation (Eckel et al., 2005; Grundy, 2016).

In this study, obese patients demonstrated markedly higher probabilities of pathological triglyc-

eride and glycemia levels, reflecting a more severe metabolic profile. International literature indicates that the accumulation of visceral adipose tissue directly contributes to increased production of atherogenic lipoproteins and impaired insulin sensitivity, substantially increasing the risk of type 2 diabetes mellitus and cardiovascular diseases (Lavie et al., 2018; Reaven, 2011).

An important finding of this study was the effect of age, as patients over 60 years exhibited higher levels of cholesterol, triglycerides, and glycemia compared with other age groups. This finding aligns with epidemiological studies showing that cardiovascular risk increases progressively with age due to physiological changes, prolonged exposure to risk factors, and reduced metabolic capacity (Yusuf et al., 2004; Roth et al., 2020).

Furthermore, the study demonstrated that alcohol consumption and smoking are closely associated with higher levels of cholesterol and triglycerides, while the effect of smoking on glycemia was not statistically significant. These findings are consistent with the literature indicating that alcohol and tobacco use contribute to dyslipidemia and oxidative stress, thereby accelerating atherosclerotic processes (Ambrose & Barua, 2004; Rehm et al., 2017).

From a nursing perspective, these findings highlight the central role of nurses in primary health care in the systematic assessment of cardiovascular risk, monitoring of anthropometric and biochemical parameters, and patient education aimed at sustainable lifestyle changes. International studies have shown that nurse-led interventions—particularly those focused on weight management, smoking cessation, and reduction of alcohol consumption—are effective in reducing cardiovascular risk in primary care settings (Smith et al., 2016; Joo & Liu, 2021).

In this context, nurses in primary health care play a key role in:

- systematic assessment of cardiovascu-

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- lar risk;
- monitoring of biochemical indicators;
- patient education for sustainable lifestyle modifications;
- coordination of multidisciplinary care.

Conclusions

This study demonstrates a strong association between obesity and the risk of developing cardiovascular diseases. Obese patients exhibit a significantly higher probability of hypercholesterolemia, hypertriglyceridemia, and glycemic disorders. The findings underscore the importance of strengthening the role of nurses in primary health care as a key strategy for cardiovascular disease prevention and for enhancing evidence-based, nurse-led preventive programs as an integral component of public health strategies.

Recommendations

The development and implementation of structured nurse-led programs aimed at the prevention of obesity and cardiovascular risk are recommended, focusing on early risk assessment, lifestyle modification, and long-term patient follow-up.

The authors declare no conflict of interest

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