



Prevalence of Obesity-Related Glomerulopathy in Morbidly Obese Patients at Cairo University Tertiary Hospital

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Abstract

Edited by: Ksenija Bogoeva-Kostovska
Citation: Abosayed AK, Aisha HAA, Fathy E, ElAnsary AMSEO, Abd Al Aziz A. Prevalence of Obesity-Related Glomerulopathy in Morbidly Obese Patients at Cairo University Tertiary Hospital. Open Access Maced J Med Sci. 2022 Apr 12; 10(E):704-707. <https://doi.org/10.3889/oamjms.2022.9121>
Keywords: Obesity; ORG; Albuminuria; CKD
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Received: 25-Feb-2022
Revised: 28-Mar-2022
Accepted: 02-Apr-2022
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Funding: This research did not receive any financial support
Competing Interests: The authors have declared that no competing interests exist
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BACKGROUND: Obesity has been reported to be a risk factor for chronic kidney disease and albuminuria. Obesity-related glomerulopathy (ORG) usually has a gradual onset, with microalbuminuria or clinically dominant proteinuria as the primary manifestation, with or without impaired renal function, and a small number of patients manifesting with microscopic hematuria or nephrotic syndrome.

AIM: The present study aimed to evaluate the prevalence of ORG in morbidly obese patients and its impact on renal function.

PATIENTS AND METHODS: This is a descriptive cross-sectional study that included patients with morbid obesity who visited the bariatric clinic in our institution during the period from October 2019 to February 2021. Patients who had no history of diabetes mellitus (DM) or hypertension underwent blood pressure measurement, assessment for 24-h urinary albumin to detect patients with laboratory-based ORG, kidney function tests, urine analysis and HbA1c, and examination by abdominal sonogram focused on both kidneys. Patients with asymptomatic micro or macroalbuminuria were recruited to the study.

RESULTS: The total number of patients screened during the study period was 1,045, out of whom 100 patients were eligible for the study according to the inclusion and exclusion criteria, denoting an albuminuria prevalence of 9.5% and there is no statistically significant relationship between this albuminuria and age, gender, and BMI.

CONCLUSION: ORG is a rising problem in the field of morbid obesity management, the current study shows that the prevalence of ORG is 9.5% in our screened cohort.

Introduction

Worldwide prevalence of obesity has doubled since 1980 [1], [2], [3], [4], [5], [6]. As the more years obesity continues, the more damaging coexisting illnesses, such as chronic kidney disease, develop [7]. Since the first case of obesity-related glomerulopathy (ORG) was reported in 1974, more and more studies have suggested that obesity has become an independent risk factor for the development of chronic kidney disease (CKD) [8], [9].

ORG usually has a gradual onset, with microalbuminuria or clinically dominant proteinuria as the primary manifestation, with or without impaired renal function, and a small number of patients manifesting with microscopic hematuria or nephrotic syndrome. Pathologically, it is characterized by increased glomerular volume, focal segmental glomerulosclerosis (FSGS), and foot process widening, but the proportion of foot process fusion is low [10].

However, the mechanism of obesity-related kidney disease is not clear; the pathogenesis of ORG is mainly summarized in three aspects. Hemodynamic

changes, renin-angiotensin-aldosterone system (RAAS) activation, adipose tissue-related factors, and inflammation seem the most probable underlying cause. The progression mechanism of ORG is very complex including podocyte damage caused by chronic low-grade lipid accumulation, compensatory hyperplasia, fibrosis, oxidative stress, and apoptosis [11], [12], [13].

The present study aimed to evaluate the prevalence of ORG in morbidly obese patients and its impact on renal function.

Patients and Methods

This is a descriptive cross-sectional study which included patients with morbid obesity who visited the bariatric clinic in our institution during the period from October 2019 to February 2021. The study was conducted after the approval of the Research Ethics Committee and in accordance with the Declaration of Helsinki.

Patients who had no history of diabetes mellitus (D.M.) or hypertension had blood pressure

measurements and an assessment for 24-h urinary albumin. Moreover, kidney function tests, urine analysis, HbA1c, and examination by abdominal sonogram focused on both kidneys were conducted. Then, patients with asymptomatic micro- or macroalbuminuria were recruited to the study. Patients with abnormal HbA1C values, urinary tract infection, or accidentally discovered hypertension (blood pressure $\geq 140/90$ in 2 different visits, 1 week apart) were excluded from the study. Furthermore, patients on angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers.

Written informed consent was obtained from each patient after a thorough explanation of the research steps.

Inclusion criteria

The subjects were considered appropriate candidates for the present study

If they were:

1. All morbidly obese patients (BMI more than or equal to 40 kg/m²).
2. All patients with micro- or macroalbuminuria in 24-h urine.
3. Normal urine analysis.
4. Willing to give consent and comply with the evaluation and treatment schedule, were 16–65 years old, both genders.
5. Patients are receiving or will receive management in a specialist obesity service.

Exclusion criteria

The following criteria were excluded from the study:

1. Known diabetic patients or accidentally discovered with HbA1c equal or more than 6.4%
2. Known Hypertensive patients or accidentally discovered to be hypertensive (more than 140/90).
3. Patients having urinary tract infection in urine analysis
4. Any patient on angiotensin-converting enzyme inhibitors OR angiotensin II receptor blockers.
5. Any patients with history or suggesting criteria for any autoimmune systemic diseases, especially systemic lupus erythematosus and vasculitis.

Study outcomes

The primary outcome of this study was the measurement of 24-h albumin in morbidly obese patients to detect micro- or macroalbuminuria and relation of it to age, BMI, and gender.

Statistical methods

The obtained data were recorded and analyzed using the Statistical Package for the Social Sciences (SPSS) version 22 (IBM Corp., Armonk, NY, USA). Numerical data were presented as mean, standard deviation, minimum and maximum, and categorical data were expressed as frequency and percentage. The level of significance was considered at $p < 0.05$. T-test (student-t-test) was used to compare numerical data in the two groups and to compare numerical data at two-time settings (paired t-test), while Chi-square (X^2) test was used to compare between categorical data.

Results

According to the inclusion and exclusion criteria, the total number of patients screened during the study was 1,045; 100 patients were eligible for the study. All patients were asymptomatic, and their kidney function parameters were normal. The prevalence of detecting albumin in urine was 9.5% of cohort.

Baseline data of the study patients

The age of the included patients ranged between 21 and 61 years (mean $36.93 \pm$ SD years, and the BMI 40–87 ($54.17 \pm$ SD kg/m²). The females included were 67% of cases (Table 1).

Table 1: Baseline data of the study patients

	Mean	Standard deviation
Age (years)	36.6	9.8
Height (m)	1.64	0.067
Weight (kg)	150.3	24.12
BMI (kg/m ²)	54.17	10.05
24-h urinary albumin (mg)	271.61	140.268
	Count	%
Gender		
Female	67	67.0
Male	33	33.0
Albuminuria		
Macro-albuminuria	52	52.0
Micro-albuminuria	48	48.0

Twenty-four hours urinary proteins ranged from 34 to 467 mg, with a mean of ($271.61 \pm$ SD mg). According to these levels, microalbuminuria (albumin levels of 30–300 mg/24 h) was detected in 48 patients (48%), while macroalbuminuria (albumin levels of >300 mg/24 h) was diagnosed in 52 patients (52%) (Table 1).

Relation of type of albuminuria and age

There is a statistically insignificant correlation between the type of albuminuria and age (p -value 0.254) (Table 2).

Table 2: Relation of type of albuminuria and age

	Micro or macroalbuminuria		p-value
	Micro	Macro	
	Mean	Mean	
Age	31.5	37.8	0.254

Relation of type of albuminuria and BMI

There is a statistically insignificant correlation between the type of albuminuria and BMI (p-value 0.423) (Table 3).

Table 3: Relation of type of albuminuria and BMI

	Micro or macroalbuminuria		p-value
	Micro	Macro	
	Mean	Mean	
BMI	53.3	55.9	0.423

Relation of type of albuminuria and gender

There is a statistically insignificant correlation between the type of albuminuria and gender (p = 0.721) (Table 4).

Table 4: Relation of type of albuminuria and gender

	Micro or macroalbuminuria				p-value
	Micro		Macro		
	Count	%	Count	%	
Gender					
Female	33	68.8	34	65.4	0.721
Male	15	31.3	18	34.6	

Discussion

Obesity has been reported to be a risk factor for chronic kidney disease and albuminuria. Despite the well-documented obesity association with diabetes mellitus and hypertension, its predisposition to albuminuria may not related to these comorbidities and sometimes, its occurrence is independent on presence of DM or hypertension. Some studies related microalbuminuria to a poor outcome of cardiovascular diseases as well as being an alarming sign for the development of chronic kidney disease. Scarce data about the prevalence of albuminuria in patients with obesity, those with no DM, or hypertension are available [14].

The present study aimed to estimate the prevalence of ORG in morbidly obese patients based on laboratory evident albuminuria either micro or macroalbuminuria.

In this study, the prevalence of albuminuria was 9.5%. This is close to the figures reported by earlier studies. Studies from France and USA found that albuminuria occurred in patients with obesity in absence of DM and hypertension, with percentages of 9.8% and 10%, respectively [15], [16], [17], [18]. Another study from the Netherlands reported a prevalence of

albuminuria in patients with severe obesity to be ranging from 13 to 21%. However, about half of these cases had hypertension [16]. The prevalence found in this study is higher than reported by another Egyptian study that reported the prevalence of albuminuria in patients having obesity without DM or hypertension to be 6.5%. This variation is caused mainly by the difference in the study population, since their study included individuals with BMI value ranging from 25 to <35 kg/m² [17].

The mean age of the included patients was 36.93 years, and the mean baseline BMI was 54.2 kg/m². According to 24-h urinary proteins, 48% of patients had microalbuminuria and the remaining 52% had macroalbuminuria.

Regarding the primary outcome of the present study, there was a statistically insignificant relation between type of albuminuria with age (p = 0.254), gender (p = 0.721), and BMI (p = 0.423).

Strength and limitations

The strength of this study, because it is a cross-sectional study, being specifying studied patients without DM and hypertension to ensure that the kidney damage is related to obesity only. The study is limited by non-assessment of the inflammatory markers or the anti-inflammatory adipokine such as adiponectin to assess the potential mediating role of systemic inflammation in the albuminuria reduction effect. Furthermore, it is limited by the absence of histopathological confirmation of ORG. However, we think that these limitations do not preclude the importance of the study.

Conclusion

ORG is a rising problem in morbid obesity management. The present study shows that the prevalence of ORG is 9.5%. Regarding the primary outcome of the present study, there was statistically insignificant relation between type of albuminuria with age (p = 0.254), gender (p = 0.721) and BMI (p = 0.423).

Statement for Informed Consent

Informed consent was obtained from all individual participants included in the study.

- Statement for conflicts of interest: The authors declare that they have no conflicts of interest.
- Ethical approval: This study has been approved by the Appropriate Institutional Research Ethics Committee.

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