

# Obesity as a Risk Factor for Disease Development: Part-I Cardiovascular Diseases and Renal Failure

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## Abstract

**Background:** Obesity was a global healthcare problem with increase in incidence with time. Reported studies suggest an association between obesity and development of some diseases.

**Aim:** To clarify if there was an association between obesity and development of some diseases in an Iraqi population.

**Materials and Method:** A review of 3 studies which included 462 patients were performed and to compared to 342 subjects as control group. Body Mass Index [BMI], age and odd ratio mean values were determined in both groups. BMI calculated by dividing the weight in kilogram by height square in meter.

**Results:** Odd ratio indicated a significant association between obesity as determined by BMI and development of hypertension ( $P < 0.0001$ ), cardiovascular disease ( $P < 0.001$ ), and renal failure ( $P < 0.001$ ).

**Conclusion:** Obesity may be a risk factor for the development of cardiovascular diseases and renal failure.

**Keywords:** Obesity, BMI, hypertension, cardiovascular disease, renal failure.

## Introduction

Obesity was a global healthcare problem with increase in incidence with time <sup>(1)</sup>. A condition that was associated with metabolic, immunologic and inflammatory changes and responses that contribute to development of multiple organ diseases <sup>(2)</sup>. Adipose tissue is not a storage site for energy, but it acts as endocrine and metabolic organ and secreted adipokines <sup>(3,4)</sup> The adipose tissue physiological complexity may interfere with functions and body processes through different mechanisms that included inflammatory, metabolic and immunologic changes <sup>(5-7)</sup> Obesity was an epidemic global health conditions with a rate of 1.9% in India to 33% in USA, which may lead to development of a chronic diseases <sup>(8)</sup>. Previously reported reviews <sup>(8-11)</sup> suggest an association between obesity and disease development. To reveal the association between obesity and cardiovascular diseases and renal failure in Iraqi community this study was conducted.

## Materials and Method

The data gathered by a review of 3 studies that included 362 patients (age range 16-86 years) and 342 control subjects (age range 14-68 years). Mean of age and BMI were calculated for each disease. The number of subjects in each group are shown in Table 1. BMI was calculated by dividing the patient weight in kg by the square of the height in meter. The study protocol was approved by Tikrit University College of Medicine Ethical Committee.

**Statistical Analysis:** The data were presented as mean  $\pm$  standard deviation. The significance between two means were determined using student t test. The odd ratio and significance levels were determined using SPSS package [version 20].

**Finding:** The age mean was significantly higher in patients with cardiovascular disease ( $P < 0.001$ ), hypertension ( $P < 0.001$ ) and renal failure ( $P < 0.008$ )

as compared to controls. Additionally, BMI was significantly higher in patients with cardiovascular disease (P<0.0001), hypertension (P<0.0001) and renal failure (P<0.0001) as compared to controls, Table 1. As shown in Table 2, odd ratio indicated that there was a

significant association between obesity and hypertension (OR=89.25; P<0.0001), renal failure (OR=4.56; P<0.001), and cardiovascular diseases (OR=3.16; P=0.001).

**Table 1. BMI and age mean values in disease groups compared to controls**

Disease	Group	Number	Mean [SD]	
			BMI	Age
Cardiovascular disease	Patient	172	27.70 [1.60]	52.30 [5.20]
	Control	102	24.56 [3.07]	37.02 [11.77]
	P value		<0.0001	<0.0001
Hypertension	Patient	120	36.41 [3.62]	18.60 [1.17]
	Control	140	27.32 [4.87]	17.72 [1.18]
	P value		<0.0001	<0.0001
Renal failure	Patient	170	28.77 [4.08]	49.33 [13.45]
	Control	100	23.83 [2.81]	45.04 [11.34]
	P value		<0.0001	0.008

**Table 2. Odd ratio of BMI with disease development**

Disease	Odd Ratio	OR 95% CI	Z value	P value
Cardiovascular	3.16	1.59-6.25	3.29	0.001
Hypertension	89.25	12.12-657.15	4.41	<0.0001
Renal failure	4.56	2.67-7.78	5.57	<0.001

**Discussion**

Obesity is a condition that with increased prevalence in developed and developing countries and contribute to many abnormalities that interfere with life style and disease development (9). The present study shows a significant association between obesity and hypertension. Hall *et al.*, (10) in a review suggest the evidence that overweight was the major aetiology of hypertension and form the rate of 65% to 75% as a risk factor for essential hypertension. Kumar *et al.*, (11), in a rural community-based study, India, which included 500 subjects, found an association between obesity and hypertension. Jiang *et al.*, (12) in a review concluded that obesity is a major risk for hypertension. Sari *et al.*, (13) from Turkey reported that in intellectual disabilities adults and adolescent were with high rate of hypertension

and obesity. Aronow *et al.*, (14) reviewed 12 studies that included a large number study population suggest an association between hypertension and BMI. Price *et al.*, (15), in a population based study in sub-saharan Africa which included 28 891 subjects found that hypertension, obesity and diabetes were common in rural and urban Malawi. Babu *et al.*, (16), in a meta-analysis systematic review that included 18 studies, reported a pooled odd ratio of 3.82 between hypertension and obesity. The induction of hypertension as a consequence of obesity may be attributed to different mechanisms that include, sodium retention, insulin resistance, kidney physical compression, rennin-angiotensin-aldosterone system activation, sympathetic nervous system increased activity, activation of mineralcorticoid receptor, brain melanocortin activation, atherosclerosis, inflammation, altered vascular function and oxidant-antioxidant ratio disruption (10,12,17). Epidemiological studies suggest an association between obesity and hypertension and diabetes in developing and developed countries (18). The present study shows a significant association between obesity and cardiovascular diseases and this was in consistent with recent reviews suggestion (19-22). Riaz *et al.*, (23) in a meta-analysis review of 4660 articles suggested that coronary artery disease and diabetes were associated with obesity, however, mendelian

randomization not prove causality, but supportive of a causal association.

Current study shows a significant positive association between obesity and renal failure. Evangelista *et al.*,<sup>(24)</sup> found an association between obesity and chronic kidney disease and loss of weight approach is effective intervention for the prevention of disease in moderate chronic kidney disease but not the severe. In literature many population-based studies reported a significant association between the progression and development of chronic kidney disease<sup>(25-37)</sup>. Although, previous studies documented the effect of obesity on chronic kidney disease, there was lower mortality in obese with end stage and advanced chronic kidney disease<sup>(29, 38-41)</sup>. Chang *et al.*,<sup>(42)</sup> in Taiwan study which included 7357 subjects with CKD and age of 20 to 85 years, reported none significant association between chronic kidney disease progression and BMI. Some studies suggested that waist-to-height ratio was associated with progression of CKD and mortality rate increase in CKD rather than BMI<sup>(43-46)</sup>. Other study reported that waist circumference in women and waist-to-height ratio in men were more associated with chronic kidney disease than BMI<sup>(47)</sup>. Lu *et al.*,<sup>(37)</sup> in USA study that included 3 376 187 subjects found that BMI  $\geq 30$  was associated with rapid loss of renal function. Kim *et al.*,<sup>(48)</sup> in Korean study that included 19,331 subjects as national population reported an association between increased albumin to creatinine ratio as chronic kidney disease risk factor and obesity. Cao *et al.*,<sup>(49)</sup> in a study that included 6852 Chinese subjects found that obesity and overweight were a risk factors for a chronic kidney disease without co-existence of metabolic syndrome. Additionally, Chang *et al.*,<sup>(50)</sup> in a study that included 62 249 metabolically healthy subjects suggest that obesity and overweight are associated with increase in chronic kidney disease. Atanassova *et al.*,<sup>(51)</sup> reported that the increase of BMI was associated with reduction in glomerular filtration rate in chronic kidney disease. Obesity lead to metabolic, structural and hemodynamic alterations in the kidney<sup>(52)</sup>. Additionally, obesity contributed to metabolic abnormalities that affect the kidney, however, the mechanisms by which chronic kidney disease induced and/or worsened is unclear<sup>(53)</sup>. Adipose tissue production of resistin, adiponectin and leptin<sup>(54-56)</sup> may cause effects on kidney through increased insulin resistance, increased insulin production, rennin-angiotensin-aldosterone system activation, oxidative stress, lipid metabolism abnormality and

inflammation<sup>(57-62)</sup>. Although, there was an obesity paradox in kidney disease as previous studies indicated, data consistency suggest a high biologic reasonability.<sup>(41)</sup>

## Conclusion

1. The present study shows a significant association between obesity and hypertension.
2. Our results have indicated a significant association between obesity and cardiovascular diseases.
3. BMI as indicator of obesity shows a significant association with chronic renal failure.

**Conflict of Interest:** Non

**Source of Findings:** Self

**Ethical Clearance:** Nil

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