Impact of obesity on kidney disease

Thesis submitted for partial fulfillment of M D degree in internal medicine

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Acknowledgements

I am very greatful to all of my supervisors, I owe an immeasurable debt to **Professor Doctor Essam Mohamed Soliman khedr** for giving me the chance to go to Canada to complete this study and gain western clinical and academic experience.
I greatly appreciate the constructive suggestions, help and support that I have received from **Dr. Faisal rehman,** my supervisor in Canada.

I particulary wish to thank **Dr. Andrew House,** professor of nephrology and statistics who gave me a great help in the approval, methodology and statistics of this study.
Finally I wish to thank **Professor Doctor Khaled Hussein Abo Seif** and **Doctor Essam Nour el dein Afify** for their support and encouragement.

List of contents

List of abbreviations

ACR: albumin creatinine ration
Ang.ll: angiotensin ii
BMI : Body mass index
CKD: chronic kidney disease
cr : creatinine
CRP: C-reactive protein
DBP : diastolic blood pressure
DM: diabetes mellitus
eGFR : estimated glomerular filteration rate
ESRD: end stage renal disease
FSGS: focal segmental gloerulosclerosis
FFA: free fatty acids
IL-٦: Interleukin- ٦
IRS: insulin resistance syndrome
NO: nitric oxide
ORG: obesity related glomerulopathy
PAPAR γ: peroxisome proliferator activated receptor γ
PKC: phosphor kinase C
RAAS : rennin angiotensin aldosterone system
SBP : systolic blood pressure
TNF: tumor necrosis factor
US: united states
WAT: white adipose tissue

List of figures

Figures of the review of literature

Figures of this study

Tables

Tables of the review of literature

Tables of this study

Introduction

The worldwide prevalence of obesity has increased dramatically over the last several decades. In the United States alone, over ٦٠% of adults ٢٠ to ٧٤ years of age are now considered overweight or obese. **(Hedley et al., ٢٠٠٤).**

The incidence and prevalence of end-stage renal disease (ESRD) continues to grow steadily. **(US Renal Data System ٢٠٠٨)**. Although much less common than obesity, ESRD is an important health problem because of the high cost of renal replacement therapy, the associated high mortality and the effect on patients' quality of life. **(Goeree et al., ١٩٩٥).**

Emerging evidence suggests that obesity may be independently related to kidney disease. For instance, animal studies have demonstrated that obesity per se can cause structural glomerular changes **(Henegar et al., ٢٠٠١)**.

Obesity increases sodium reabsorption, impairing naturesis. Obesity also causes renal vasodilatation and glomerular hyperfilteration that initially serves as compensatory mechanism to maintain sodium balance in the face of increased tubular reabsorption. In long term these changes create a haemodynamic burden on the kidneys that causes glomerular injurey. **(Hall et al., ٢٠٠٤).**

With prolonged obesity, there is urinary protein excretion and gradual loss of kidney function. **(Hall et al., ٢٠٠٤).**
Elevated rates of urinary excretion predicts target organ damage, notably renal disease so the identification of obese

albuminuric individuals has the potential of defining persons at increased risk of chronic kidney disease **(chagnac et al., ٢٠٠).**

There is also an evidence that obesity per se is a pro-inflammatory state. Obesity is associated with increased levels of acute phase reactants and cytokines as well as oxygen species. **(bagby, ٢٠٠٤).**
Wu et al., ٢٠٠٦ studied gene expression profiles in renal biopsies of six patients with obesity-related glomerulopathy. Compared with normal controls, the expression of genes related to lipid metabolism, inflammation and insulin resistance was significantly increased.

Aim of the work

Study the association and impact of obesity on chronic kidney disease.

Review of literature

OBESITY

DEFENITION:

Body Mass Index:

The World Health Organization defines obesity as "abnormal or excessive fat accumulation in adipose tissue, to the extent that health is impaired". The degree of health impairment is determined by three factors: the amount of fat, the distribution of fat, and the presence of other risk factors ***(World Health Organization, ٢٠٠٠)***.

Body mass index (BMI) is calculated by dividing weight (in kilograms) by height (in meters squared). There is a strong curvilinear relation between BMI and relative body fat mass. The BMI has been proved relatively reliable, except in the extremes of age or height and in those individuals who are very fit and have a muscular build. Thus, the current practical definition of obesity is based on the relationship between BMI and health outcome rather than BMI and body composition ***(Fernandez et al., ٢٠٠٣)***.

Hill et al., ٢٠٠٥ summarized the guidelines for classifying weight status by BMI. Large epidemiologic study has established that there is a strong relationship between BMI and mortality. Obese persons have higher risk for adverse health consequences than those who are overweight ***(Ross and Katzmarzyk, ٢٠٠٣)***.

A diversity of tables have been published to rapidly calculate the BMI of a subject and to assign a weight classification. An example is shown here ***(Ogden et al., ٢٠٠٤)***.

■**TABLE ١:** Weight Classification by Body Mass Index■

Status	**Obesity Class**	**Body Mass Index (kg/m^2)**	**Risk of Disease**
Underweight		< ١٨.٥	Increased
Normal		١٨.٥-٢٤.٩	Normal
Overweight		٢٥.٠-٢٩.٩	Increased
Obesity	I	٣٠.٠-٣٤.٩	High
	II	٣٥.٠-٣٩.٩	Very high
	III	> ٤٠.٠	Extremely high

(Hill et al., ٢٠٠٥)

Factors Affecting BMI-Related Risk:

Several factors influence BMI-related health risk. For example, obese persons with excess abdominal fat are at increased risk for diabetes, hypertension, dyslipidemia, and ischemic heart disease than obese persons whose fat is located predominantly in the lower body ***(Berggren et al., ٢٠٠٤)***. Visceral adiposity can be measured in a number of ways: by MRI scanning or CT scans of the abdomen or by dual X-ray absorptiometry (DEXA) with a specific abdominal window. Such techniques are expensive and difficult to apply to the assessment of central obesity in most clinical practice. However, assessment of visceral fat by a single CT slice at L٤/L٥ has become a recognized reference measure and is often used in obesity studies ***(Caterson and Gill, ٢٠٠٢)***.

Other Methods Used for Determination of Obesity:

Bioelectrical impedance is a less expensive method for assessing body composition, but measures are a complex function of electrolyte and water content, and are not accurate without careful standardization ***(Ryo et al., ٢٠٠٥)***.

Other inexpensive and practical methods to accurately localize body fat distribution in humans include:

١) *Waist circumference* (the narrowest circumference midway between the lower border of the ribs and the upper border of the iliac crest, taken from the side) is highly correlated with abdominal fat mass and is therefore often used as a surrogate marker for abdominal (upper body) obesity. Waist circumference values denoting increased risk for metabolic diseases have been proposed on the basis of epidemiologic data. For men, a waist circumference greater than ١٠٢ cm (٤٠ inches) and, for women, a waist circumference greater than ٨٨ cm (٣٥ inches) have been proposed as cutoff values for increased risk ***(Stewart et al., ٢٠٠٣)***.

٢) The waist to hip ratio (WHR). A WHR of more than ١.٠ in men and ٠.٨٥ in women identify subjects with abdominal fat accumulation ***(Kopelman, ٢٠٠٠)***.

Another factor that modifies the risk of obesity-related complications is weight gain during adulthood. In both men and women, weight gain of ٥ kg or more since age ١٨ to ٢٠ years is associated with an increased risk of diabetes, hypertension, and coronary heart disease, and the risk of disease increases with the amount of weight gained ***(Koh-Banerjee et al., ٢٠٠٤)***.

Risks of developing obesity-associated diabetes or cardiovascular disease can also be modified by aerobic fitness. The incidences of diabetes and cardiovascular mortality were lower in those who were fit, as defined by maximal ability to consume oxygen during exercise, than in those who were unfit ***(Nagano et al., ٢٠٠٤)***.