Prevalence of obesity among hemodialysis patients

Thesis

Submitted for partial fulfillment of M.Sc.

Degree of internal medicine

By

Mohamed Hashem Abd Elmegid Ismail

M.B. B.Ch., Faculty of Medicine

Assiut University

Supervised by

Prof. Dr.Mahmoud Abd Elfatah

Professor of general medicine and nephrology

Faculty of Medicine, Ain Shams University

Dr.Essam Nour Eldin

Lecturer of general medicine and nephrology

Faculty of Medicine, Ain Shams University

Faculty of Medicine

Ain Shams University

Cairo 2011

نسبة حدوث السمنة بين مرضى الاستصفاء الدموي

رسالة مقدمة من

الطبيب /محمد هاشم عبد المجيد اسماعيل

توطئه للحصول على درجة الماجستير في الباطنة العامة

تحت إشراف

أ.د / محمود عبد الفتاح

أستاذ أمراض الباطنة و الكلى

كلية الطب – جامعة عين شمس

د/ عصام نور الدين

مدرس أمراض الباطنة و الكلى

كلية الطب – جامعة عين شمس

كلية الطب

جامعة عين شمس

القاهرة ٢٠١١

Summary & Conclusions

For more than a decade, the relationship and comorbidity of obesity among chronic hemodialysis patients has been an area of active clinical research.

Although several studies have shown that obesity is one of causes of renal impairment and other medical problems such as diabetes mellitus, hypertension, ischemic heart disease, obesity in hemodialysis patients improve quality of life what is called reverse epidemiology.

Obesity is measured by body mass index and waist hip ratio, some studies consider waist hip ratio (central obesity) good indicator for cardiovascular risk factor.

The aim of this work was to study the prevalence of obesity among hemodialysis patients and to find relation between obesity and some clinical variables.

In this study obesity was independently associated with increased risks for chronic renal failure, obesity was found in 57.4% of total patients included in this study.

The most common causes for renal failure were hypertension (104 patients from 202 patients 51.5%), diabetes mellitus (24 patients from 202 patients 11.5%).

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List of Abbreviations

WC	waist circumference
ICD	International classification of diseases
WHO	World Health Organization
DEXA	dual energy absorptiometry
MRI	magnetic resonance imaging
CT	computerized tomography
BIA	bio-electric impedance analysis
BMI	Body mass index
WHR	The waist-to-hip ratio
OSA	obstructive sleep apnea
OHS	obesity hypoventilation syndrome
GLUT	glucose transporter
FFA	Free fatty acids
HDL	High density lipoprotein
CRP	C-reactive protein
DM	diabetes mellitus
LDL	Low density lipoprotein
VLDL	very Low density lipoprotein
HD	Hemodialysis
LPa	Lipoprotein a
NEFA	non esterified fatty acids
CVD	cardiovascular disease
NHANES III	third National Health and Nutrition Examination Survey
RAAS	renin-angiotensin-aldosterone system
AHI	apnea-hypopnea index
CNS	central nervous system
REM	rapid eye movement
WCRF	World Cancer Research Fund
IGF-l	insulin-like growth factor -1
GFR	Golmerular filtration rate
PREVEND	Prevention of Renal and Vascular End Stage Disease
TGF	transforming growth factor
CKD	chronic kidney disease
ESRD	End stage renasl disease
TNF-α	Tumor necrosis factor α
IL-6	Inter lukin -6
SREBP	sterol regulatory element binding protein

PD	Peritoneal dialysis
CHF	congestive heart failure
NCEP	Third report of the national cholesterol education program
FSGS	focal segmental glomerulosclerosis
ANP	Atrial Natriuretic Peptide
cGMP	Cyclic Guanidine Monophosphate
ICF	intra cellular fluid
ECF	extra cellular fluid
AVF	arterio venous fistula
MCP-1	monocyte chemoattractant protein-1
BV	Blood volume
PAI-1	plasminogen activator inhibitor type-1
ANP	Atrial Natriuretic Peptide
INF- γ	Interferon gamma
MHD	maintenance hemodialysis

Introduction

Obesity, characterized by the accumulation of excess body fat, is currently present in one-fifth or more of the adult population in most Western societies ***(Seidell JC et al., 2005).***

Despite the fact that increased body fat can have important implications for health and well being, the presence of increased body fat alone does not necessarily imply or reliably predict ill health ***(Pischon T et al., 2008).***

Thus, the current anthropometric classification systems, based on simple clinical measures, such as height, weight or waist circumference (WC), do not accurately reflect the presence or severity of obesity-related health risks, co morbidities or reduced quality of life. Although the term 'morbid' is often added as a qualifier to describe severe obesity in cases where the health consequences of excess weight are evident, no clear definition or consistent use of this term exists. The current systems used to classify obesity therefore have limited application for clinicians and researchers.

Classification of obesity

*Historical approaches to classify obesity.

Past systems have used anatomical terms to characterize different phenotypes of the condition, both at a cellular level (hyperplasic vs. hypertrophic types) and based on the gross distribution of body fat depots.The observation by Vague in 1949 ***(Vague J et al ., 1991)*** that individuals who have an android (upper body) vs. a gynoid (lower body) distribution of body fat have an elevated risk of various metabolic disorders has been confirmed by multiple studies and serves as the basis for sub classifying patients by measurement of WC or waist-to-hip ratio ***(Janssen I et al ., 2004).***

Etiological classifications of obesity reflect eclectic attempts to identify the numerous origins and pathways for the development of the obesity (ies) and various obesity syndromes. This approach was also adopted by the ICD 10th Edition for classification of obesity ***(World Health Organization. 2008).*** Although some of these recognized etiologies, such as endocrine- or drug-induced weight gain, have therapeutic implications, others such as 'simple' obesity, provide no meaningful reflection of etiology or guide to management.

Historical classification for obesity:

*Anatomical characteristics of adipose tissue and fat distribution:

An anatomical classification of obesity can be based on the number of adipocytes on the regional distribution of body fat, or on the characteristics of localized fat deposits. ***(Bray GA et al., 1978)***

A-Size and number of fat cells

1- **Hypertrophic obesity**.

Enlarged fat cells are the pathologic sign of obesity Enlarged fat cells tend to correlate with an android or truncal fat distribution , and are often associated with metabolic disorders such as glucose intolerance, dyslipidemia, hypertension, and coronary artery disease. ***(Bray GA et al., 2007).***

2- **Hypercellular obesity.**

An increase in the number of fat cells usually occurs when obesity develops in childhood. Whether it begins in early or middle childhood, this type of obesity tends to be severe. Increased numbers of fat cells may also occur in adult life. ***(Bray GA et al., 2007).***

B-Fat distribution:

1-Upper body obesity with excess subcutaneous truncal abdominal fat. (android)

2- Lower body obesity with excess gluteo femoral fat (gynacoid)

(Pouliot MC et al., 1994)

Etiologic Classification

A -Neuroendocrine Obesity

1-Hypothalamic obesity

2- Cushing's syndrome

3-Hypothyroidism

4-Growth hormone deficiency

5-Polycystic ovary syndrome

6- hyperinsulinism

(Bray GAet al., 2004)

B-Iatrogenic causes.

Several drugs can cause weight gain, including a variety of psychoactive agents and hormones for example Tricyclic antidepressant, Monoamine oxidase inhibitors, Selective serotonin reuptake inhibitors. ***(Allison DB et al., 1999)***

C- Sedentary Lifestyle.

A sedentary lifestyle lowers energy expenditure and promotes weight gain in both animals and humans ***(O'Dea K et al., 1993)***

D- Genetic and Congenital Disorders.

Fore example Prader-Willi syndrome results from an abnormality on chromosome 15 q 11.2 that is usually transmitted paternally. This chromosomal defect produces a "floppy"baby who usually has trouble feeding. Overweight in these children begins at about 2 years and is associated with overeating, hypogonadism, and mental retardation ***(Gunay et al., 1997).***

E- Dietary obesity.

The amount of energy intake relative to energy expenditure is the central reason for the development of obesity. Voluntary overeating (repeated ingestion of energy exceeding daily energy needs) can increase body weight in normal-weight men and women. ***(Levitsky DA et al., 2005)***

F-Psychological and Social Factors.

Obesity is more prevalent in lower socioeconomic groups Black males are less obese than white males, whereas black women shown high prevalence of obesity at all ages than white women

There is recognition that that there may be a complex relationship between psychological adjustment and obesity ***(Partonen T et al., 1998)***

*Anthropometric classification of obesity:

Ideally, quantitative measurement of body fat would be the most direct determinant of obesity. However, there are no current methods that are precise, practical, economical and reliable for general use ***(Jebb SA et al., 1993).*** Instead, for simplicity, past and present definitions of obesity are based on anthropometric approaches that utilize simple clinical measures such as weight and height to quantify and define obesity. In 1997, the World Health Organization (WHO) endorsed BMI as the most useful measure of obesity and provided a classification of overweight in adults ***(World Health Organization.1998).***Since then, the WHO BMI cut points for underweight, healthy weight, overweight and obese (classes I–III) have been internationally adopted by clinical guidelines and for population surveys. ***(Lau DCW et al., 2007)*** The additional anthropometric measurements of WC or waist-to-hip ratio have been recommended because abdominal fat has been shown to provide an independent risk estimate beyond BMI alone. ***(Klein S et al., 2007)***, current guidelines recommend the measurement and recording of both BMI and WC(Third report of the national cholesterol education program (NCEP)2002) albeit with different cut points for different ethnic groups.***(Razak F et al., 2007)***

Table 1 WHO classification of weight

Weight status	*Body mass index (BMI), kg/m²*
Underweight	<18.5
Normal range	18.5–24.9
Overweight	⩾25
Preobese[a]	25.0–29.9
Obese class I	30.0–34.9
Obese class II	35.0–39.9
Obese class III	⩾40

(World Health Organization.1998)

Proposed functional and disease-related staging for obesity.

Although the current anthropometric classifications continue to serve their function as surrogate measures for the magnitude of body fat and its distribution and to assess progress in management, complementing these parameters with a simple disease-related and functional staging system would provide additional clinical information to guide and evaluate treatment. The rationale for a clinical staging system is also based on the notion that patients with current health problems related to obesity should be treated more aggressively , a staging system must aid in the equitable identification of patients, who would most likely benefit from aggressive weight management. The proposed staging system would be based on simple clinical assessments that include medical history, clinical and functional assessments as well as simple routine diagnostic investigations that are easily and widely available. Rather than simply categorizing patients based