



Contents lists available at ScienceDirect

# Diabetes & Metabolic Syndrome: Clinical Research & Reviews

journal homepage: [www.elsevier.com/locate/dsx](http://www.elsevier.com/locate/dsx)



## Original Article

# Metabolically healthy obese and unhealthy normal weight in Iranian adult population: Prevalence and the associated factors

Karimollah Hajian-Tilaki<sup>a,\*</sup>, Behzad Heidari<sup>b</sup>

<sup>a</sup> Dept of Biostatistics and Epidemiology, Babol University of Medical Sciences, Babol, Iran

<sup>b</sup> Dept of Internal Medicine, Ayatollah Rohani hospital, Babol University of Medical Sciences, Babol, Iran

## ARTICLE INFO

### Article history:

Received 27 September 2017

Accepted 22 November 2017

Available online xxx

### Keywords:

Metabolically unhealthy

Metabolically healthy

Normal weight

Obese/overweight

Risk factors

## ABSTRACT

**Aims:** The objective of this study was to determine the prevalence and the associated factors of metabolically unhealthy in normal-weight and metabolically healthy in obese.

**Methods:** We analyzed the data of a representative sample of 986 participants recruited among adult population of north of Iran. Data were collected regarding demographic characteristics, lifestyle, body mass index, abdominal obesity measures, blood pressure, and lipid profiles. The participants were classified as metabolically healthy obese (MHO) and metabolically unhealthy normal-weight (MUNW). Metabolically unhealthy was defined as the presence of  $\geq 2$  non-obese components of metabolic syndrome based on ATP III criteria.

**Results:** The prevalence rate of MUNW and MHO accounted for 17.2% and 15.1% respectively. Mean age of participants with metabolically unhealthy was significantly greater than metabolically healthy in both normal weight and overweight/obese ( $P=0.001$ ). The results of multiple logistic regression analysis showed in normal-weight individuals, a significant association of MUNW was found with age group of 50–59 years ( $OR=3.83$ ,  $95\%CI: 1.71-8.57$ ) and 60–70 years by  $OR=4.74$  ( $95\%CI: 1.79-12.54$ ) as compared with age group of 20–29 years. It was also associated with current smoking. While metabolically healthy state in overweight/obese was inversely associated with age 50–59 years by  $OR=0.26$  ( $95\%CI: 0.13-0.54$ ) and age 60–70 years by  $OR=0.15$  ( $95\%CI: 0.05-0.39$ ) and higher WC by  $OR=0.47$  ( $95\%CI: 0.31-0.72$ ) but positively associated with female-sex by  $OR=1.74$  ( $95\%CI: 1.07-2.82$ ).

**Conclusion:** Aging and smoking are significantly associated with metabolic abnormalities in normal-weight while aging, abdominal obesity negatively and female positively associated with metabolically healthy in obese.

© 2017 Published by Elsevier Ltd on behalf of Diabetes India.

## 1. Introduction

Obesity plays a major contribution in the development of global epidemic of diabetes, insulin resistance, metabolic syndrome (MetS), cardiovascular diseases (CVD), stroke and cancer [1–4]. A worldwide epidemic of obesity has been reported in both developed and developing countries [5,6] that explains the increased morbidity and mortality from diabetes and CVD in recent decades. Additionally, obesity and its related co-morbidities can unfavourably influence on health-related quality of life in the elderly population [7]. In the United States about 25% of the adult populations are clinically obese [5]. Similarly, the trend of obesity and the related comorbidities are dramatically increasing in the developing countries in recent decades [8,9]. In Islamic

republic of Iran, particularly in the north regions, over half of the adult population suffer from overweight or obesity, and in Iranian adults the prevalence of cardiometabolic risk factors range from 15 to 60% and vary according to age, sex and ethnicity [10–13]

Although, there is a clear link between overweight/obesity and metabolic abnormality, but obesity, in particular abdominal obesity, is the main component of MetS [14,15]. Nonetheless, all obese individuals have not metabolic abnormalities, but nearly 10–25% of the obese individuals are metabolically healthy because of preserved insulin sensitivity [16–18]. On the other hand, a similar rate of normal weight individuals are metabolically unhealthy. Variations in fat distribution and insulin sensitivity are the main factor for definition of normal weight or obese individuals [19]. The two phenotypes of obesity are defined as metabolically healthy obese (MHO) and metabolically unhealthy normal weight (MUNW). The MHO individuals have a favorable lipid profile, normal blood pressure, normal insulin response and a lower visceral fat, in spite of excess amount of body fat, while the MUNW

\* Corresponding author.

E-mail address: [drhajian@yahoo.com](mailto:drhajian@yahoo.com) (K. Hajian-Tilaki).

have metabolic abnormalities with insulin resistance [16–18,20,21].

The distinction of these two phenotypes has been debated, however, the presence of well condition in MHO individuals has been partly attributed to normal adipose tissue function [20]. It is important to distinguish them as opposed to just lean versus obese. Nonetheless, data in regard to lifestyle and demographic characteristics of subjects with MHO and MUNW are conflicting [22]. Among the general population of north of Iran, metabolic abnormalities are prevalent [11,12], but the issue of metabolic abnormalities in relation to obesity phenotypes has been less studied and information in this context are scarce. We therefore conducted the present study to determine the prevalence of MHO and MUNW among the obese and normal-weight individuals respectively, and their association with lifestyle factors.

## 2. Methods and subjects

### 2.1. Study design and subjects

The data of this analysis were extracted from an implemented project of Babol Lipid and Glucose study in the north of Iran that was primary focused on clustering of metabolic abnormality in adult population. This population based cross-sectional study was carried in 2012 and a random sample of 1000 adults aged 20–70 years were selected in the study using two stage cluster sampling techniques. The full description of sampling procedure and recruitment criteria was described in details elsewhere [12]. In brief, 25 random clusters of the population under coverage of urban health centers were selected and then within each cluster about 40 subjects were recruited in a family health survey. All pregnant women were excluded in sample selection. In addition, 14 subjects were also excluded from the present analysis due to underweight (BMI < 18.5) and/or missing data needed for determining BMI and MetS. Finally, a total of 986 participants

were included in this study. The study protocol was approved by the Ethical Committee of Babol University of Medical Sciences and all participants gave a written informed consent prior to participation.

### 2.2. Data collection and measurements

Trained nurses visited all subjects at home. The demographic data and life style data were collected with designed questionnaire. These data included age, sex, marital status, educational level, and history of diabetes, hypertension and CVD as well. The physical activity was assessed with a short form of standard International physical activity questionnaire that included 12 items and measure the type, the duration and the intensity of physical activity. The validity and reliability of this questionnaire was confirmed in several reports [23,24]. The weight and height was measured at the nearest point to 0.1 kg and 0.1 cm using a portable scale and stadiometer respectively while all participants wearing light indoor clothing without shoes. From these two measures, BMI was calculated by weight in kg divided by square of height in meter [2]. Waist and hip circumference (WC and HC respectively) were measured at the nearest point to 0.1 cm with non-stretchable type over the abdomen at the narrowest point between costal margin and iliac crest, and widest diameter around the buttocks respectively. From these anthropometric measures, waist to height ratio (WHtR) and waist to hip ratio (WHR), conicity index (CI) and abdominal volume index (AVI) as measures of abdominal fat distribution were calculated. The systolic and diastolic blood pressure (SBP, DBP) were measured in a setting position two times consecutively within 10 min rest using a digital sphygmomanometer with standard protocol. The mean of the two measures was taken in analysis. All examined participants were invited to central lab of the Ayatollah Rohani hospital, affiliated to Babol university of medical sciences, Babol, Iran. The overnight 10–12 h fasting blood samples were provided for measurement of the total cholesterol

**Table 1**

The frequency and the proportion of metabolically healthy and unhealthy according to demographic characteristics, life style related factors and the mean of abdominal obesity indexes in normal weight and obese individuals.

Characteristics	Normal weight		P- value	MHO	Overweight/ Obese		P- value
	MHNW	MUNW			MUO		
n (Prevalence%)	155(15.7)	170(17.2)	–	149(15.1)	512(51.9)	–	–
Age year, Mean ± SD	34.4 ± 12.1	43.7 ± 14.9	0.001	39.0 ± 10.3	45.9 ± 12.2		0.001
Gender n(%)							
Male	81(43.5)	105(56.5)	0.08	48(18.5)	211(81.5)		0.04
Female	74(53.2)	65(46.8)		101(25.1)	301(74.9)		
Educational Level n (%)							
<High School	38(33.6)	75(66.4)	0.001	60(19.2)	252(80.8)		0.05
≥ High School	117(55.2)	95(44.8)		89(25.5)	260(74.5)		
Smoking n(%)							
None	142(51.3)	135(48.7)	0.005	138(23.4)	451(76.6)		
Current	8(22.9)	27(77.1)		9(17.0)	44(83.0)		0.25
Former	5(38.5)	8(61.5)		2(10.5)	17(89.5)		
Physical Activity n(%)							
Low	39(46.4)	45(53.6)		54(20.7)	207(79.3)		
Moderate	83(44.6)	103(55.4)	0.13	79(23.9)	251(79.1)		0.64
Vigorous	33(60.0)	22(40.0)		16(22.9)	54(77.1)		
Wc (Cm), Mean ± SD	80.9 ± 10.2	83.0 ± 10.1	0.07	93.9 ± 13.4	95.9 ± 12.7		0.001
WHR, Mean ± SD	0.84 ± 0.08	0.85 ± 0.09	0.07	0.85 ± 0.10	0.89 ± 0.10		0.001
WHtR, Mean ± SD	0.48 ± 0.06	0.49 ± 0.05	0.07	0.57 ± 0.08	0.61 ± 0.09		0.001
CI, Mean ± SD	1.21 ± 1.35	1.23 ± 0.13	0.15	1.25 ± 0.14	1.29 ± 0.15		0.001
AVI, Mean ± SD	13.54 ± 3.27	14.19 ± 3.32	0.07	18.29 ± 5.5	20.23 ± 6.1		0.001

WC: waist circumference, WHR: waist to hip ratio, WHtR: waist to height ratio, CI: conicity index, AVI: abdominal volume index, SD: standard deviation, MHNW: Metabolically healthy normal weight, MUNW: metabolically unhealthy normal weight, MHO: Metabolically healthy obese, MUO: Metabolically unhealthy obese.

Download English Version:

<https://daneshyari.com/en/article/8658809>

Download Persian Version:

<https://daneshyari.com/article/8658809>

[Daneshyari.com](https://daneshyari.com)