# Epidemiology of Abdominal Obesity in Egypt

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## ABSTRACT

Abdominal obesity is assessed through measurement of WC. An increase in WC carries a greater risk of development of future cardiovascular events and diabetes than increased BMI. Abdominal obesity is now recognized as a central component of the metabolic syndrome. Various measurements were used to define the threshold of WC which is considered the upper limit of normal. The cutoff points are arbitrary and are population and gender specific. New Egyptian WC cutoff points for abdominal obesity are developed based upon data from the Egyptian National Hypertension Project (NHP). These are 97.5 cm for men and 92.3 cm for women. Cut-off points recommended by IDF were 94 cm for men and 80 cm for women derived from the Europid cutoff points. The prevalence of abdominal obesity in Egyptians based upon the IDF guidelines is 30.2% for men and 70.9% for women while based on new Egyptian criteria, the prevalence of abdominal obesity in men is 37.1% and in women 50.8%. A positive correlation was found between WC and most of the cardiometabolic risk factors.


## AIM OF THIS REVIEW

1. Outline approaches used for the assessment of abdominal obesity.
2. Provide criteria for waist circumference cut-off points diagnostic of abdominal obesity among Egyptians.
3. Define the prevalence of abdominal obesity in Egypt.
4. Examine the relationship between WC and prevalence of cardiometabolic risk factors among Egyptians.

## INTRODUCTION

A very high rate of obesity was reported among Egyptians, especially among hypertensive Egyptian women with an age adjusted prevalence rate of 48.8%[1]. Recently estimates of WC were gaining increasing importance as a more useful tool in the assessment of body fat distribution and in the diagnosis of abdominal obesity. Abdominal obesity is now an established cardiometabolic risk factor. Indices of abdominal adiposity such as waist-to-hip ratio (WHR) and waist circumference (WC), predict coronary heart disease and stroke better than BMI[2.] Individuals with abdominal obesity are at a great risk for developing diabetes and atherosclerotic CVD[3-5]. Abdominal obesity is commonly associated with hyperinsulinemia, impaired glucose tolerance, hyperglycemia, as well as increase in plasma triglycerides, small LDL cholesterol particles and apolipoprotein B and a decrease in HDL-C. Also, abdominal obesity is a major component of the metabolic syndrome. The diagnosis of abdominal obesity depends on measurement of WC. An increase of WC beyond a specific cut-off point will establish the diagnosis. In Egypt, other Arab and Middle Eastern countries, the thresholds of WC diagnostic of abdominal obesity are derived from European data [(6)]. There is a need to develop national guidelines for definition of abdominal obesity.

## ASSESSMENT OF OBESITY AND BODY FATNESS

- **Methods of assessment of obesity and body fatness:**
  - Three approaches are generally used in clinical practice to define and classify overweight and obesity namely: body mass index (BMI), waist circumference (WC) and waist/hip ratio (WHR).
  - BMI is the most frequently used measure of obesity. However, BMI does not account for the wide variations in body fat distribution, and has considerable limitations in prediction of inta-abdominal fat accumulation[7]. Furthermore, increase in weight and BMI can be due to increase in muscle mass rather than an increase in body fat.
  - WHR is sometimes used as an index of regional, adipose tissue distribution. However, the WHR value does not account for large variations in the level of total fat and abdominal visceral adipose tissue[8]. Moreover, it requires two measurements, waist and hip circumference, which may contribute to summative measurement error.

- WC is a convenient and simple index that determines the accumulation of abdominal adipose tissue[7]. Accordingly, WC has been shown to be a preferred index over the WHR to estimate the amount of abdominal adipose tissue[9,10]. WC is probably the most reliable clinical measure of abdominal fat compartments and is often used as a surrogate marker of abdominal fat mass, since it correlates with abdominal fat mass (subcutaneous and intra-abdominal)[10,11] and is associated with cardiometabolic disease risk[12].

- **Importance of WC measurement**
  - Abdominal obesity characterized by high WC is a stronger predictor than generalized obesity defined by elevated BMI of subsequent development of major coronary events, vascular mortality, diabetes and metabolic syndrome.
  - Men and women who have WC greater than 102 cm and 88 cm, respectively, are considered to be at increased risk for cardiometabolic disease[12]. Furthermore, increased WC is a central component of the metabolic syndrome (MS). Recent IDF guidelines for definition of MS[13] identify an increased WC as a prerequisite for diagnosis.
  - WC can identify persons who are at greater cardiometabolic risk than those identified by BMI alone[14].
  - No clear evidence that WC provides clinically meaningful information that is independent of well-known cardiometabolic risk factors.

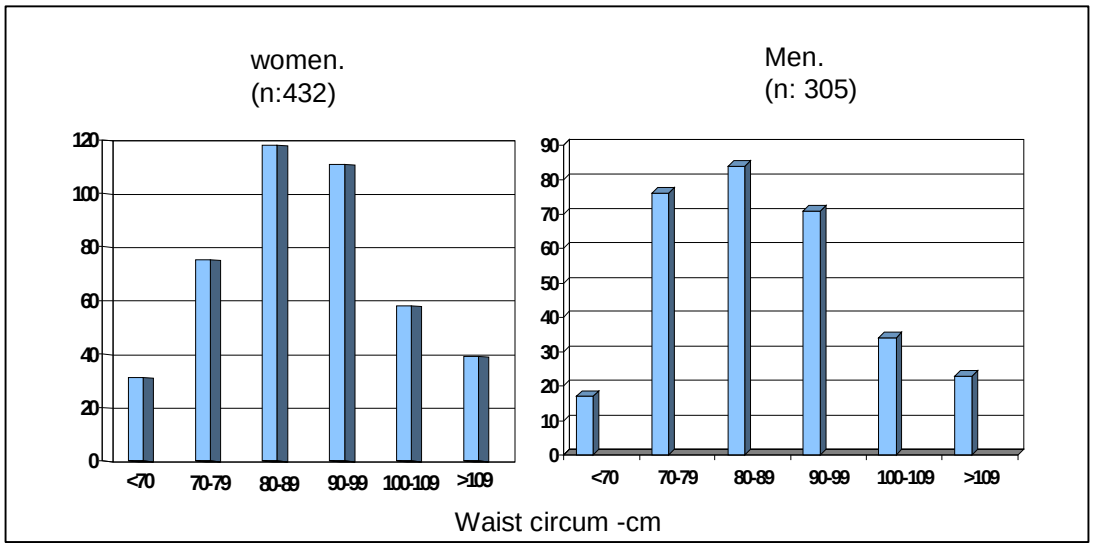
## WAIST CIRCUMFERENCE IN EGYPTIANS

*Source of data:* The following data about WC in Egyptians were collected during phase-2 of the Egyptian National Hypertension Project (NHP) survey. The survey (1991-93) was conducted in 21 sampling locations in six Egyptian governorates, representing all Egyptian geographic areas and socio-economic groups. The details of sample design, field operations, techniques for blood pressure measurements and laboratory tests were reported in previous publications[15-17].

- *WC measurements:* The average WC for normotensive (NT) men was 88 cm and for NT women was 91.7 cm. In hypertensive patients the average WC for men was 96.4 cm and for women 96.7 cm. Figure (1) shows the frequency distribution of WC in NT Egyptian

men and women. The highest frequency was a WC of 80-89 cm for both men and women.

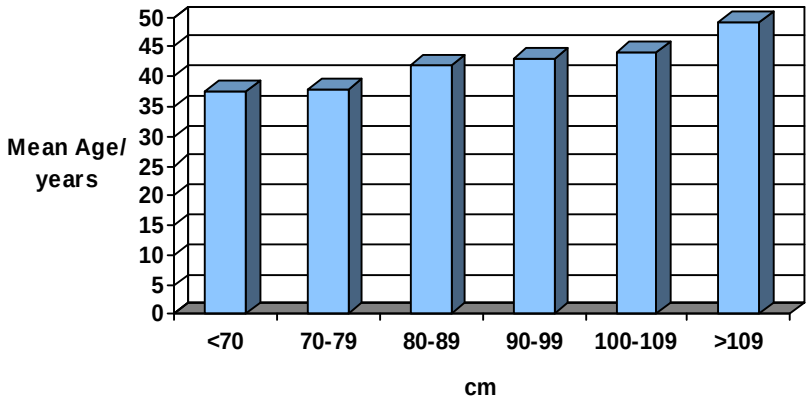
*Figure (1): Waist Circumference in NT Egyptians: Frequency Distribution*




*Source: Egyptian NHP (1991-1994)*

- *Age and WC measurements*: There was a gender differences regarding the relation between age and WC. In men there was no significant relationship between increasing age and WC. Among males with smallest WC of < 70 cm the mean age was 47.4 years, while in those with largest WC (> 109 cm), the mean age was 48.6 years. In women, aging was associated with increased WC. The mean age for women with the smallest WC (< 70 cm) was 37.4 years, while in those with the largest WC (>109 cm), it was 45 years (figure 2).

*Figure (2): WC and Age (mean) in Women*




*Source: Egyptian NHP (1991-1994)*

## CRITERIA AND PREVALENCE OF ABDOMINAL OBESITY

- *WC cut-off points:*
  - The cut-off points for defining abdominal obesity are arbitrary. There are populations and gender specific cut-off values (Table 1). The current WC cut-off points suggested by WHO are not based on associations with CVD risk factors, but rather on their correlation with corresponding values of BMI[24]. WC values corresponding to a BMI of 30 kg/m$^2$ were taken as arbitrary cut offs[18].
  - There is no consensus as the WC cut-off for abdominal obesity. The recommended WC thresholds for increased cardiometabolic risk and abdominal obesity were derived from WC values that correlate with a BMI $\geq$ 30 kg/m$^2$ <18). The IDF recommends the use of the Europid cut-off points (94 cm for males and 80 cm for females) in these countries until more specific data are available (Table 1). These definitions are based on data from western populations which may not be applicable to our region. Very few studies have specifically investigated abdominal obesity cut off points associated with different diseases in non-white populations.

*Table (1): Waist Circumference Cut-off Points for Abdominal Obesity recommended by IDF and WHO in Different Ethnic Groups*

| WC (cm) | Europid | South Asians | Chinese | Japan | South & Central America | Sub-Saharan Africa | Eastern Mediterranean & Middle Eastern (Arab) |
|---|---|---|---|---|---|---|---|
| M | 94 | 90 | 90 | 85 | 90* | 94* | 94* |
| F | 80 | 80 | 80 | 90 | 80* | 80* | 80* |

***** *Cut-off points to be used until more specific data are available*

- *Prevalence of abdominal obesity*
  - Surveys have demonstrated a high prevalence of abdominal obesity in western populations. The prevalence of obesity in the US men (WC > 102 cm) and women (WC > 88 cm) was 36 and 52 % respectively in 1999-2000[19]. In European men and women, abdominal obesity defined according to cut-off values between 90-102 cm for men and 80-92 cm for women was 8 and 13% in France[20], 23 and 65% in Spain[21] and 18 and 39% in Turkey[22].
  - In Cameron- Africa- there is a prevalence of abdominal obesity of 18% in men (WC > 94 cm) and 66% in women (WC > 80 cm)[23].
- *Egyptian WC cut-off points for abdominal obesity:*
  - Data derived from the Egyptian NHP was used to identify the Egyptian WC threshold for increased cardiometabolic risk and abdominal obesity. WC values corresponding to a BMI of 30 kg/m2 were taken as cut-off points. A linear regression was used to identify the corresponding WC in men and women using the following equation: $X = B_0+B_1(Y)$ where X is WC, $B_0$ is intercept, $B_1$ is the slope and Y is BMI.
  - The cut-off points for abdominal obesity for Egyptian men and women were 97.5 and 92.3 cm respectively.
  - We are currently investigating the predictive value of these abdominal obesity cut-off points for a number of cardiometabolic risk factors (hypertension, diabetes and dyslipidemia) using the receiver operating characteristics (ROC) curve. With

the ROC technique, comparison of sensitivity with the specificity rates is made over the entire range of WC.

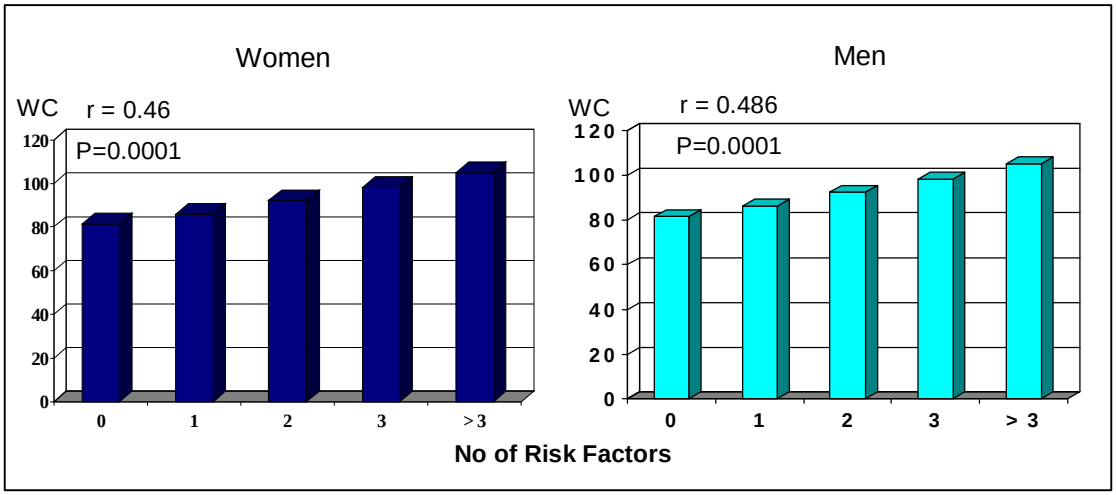
- *Prevalence of abdominal obesity in Egyptians:*
    - Based upon the IDF guidelines for WC cut-off points, classifying Egyptians as Europid (94 cm for men and 80 cm for women), abdominal obesity was present in 30.2% of NT men and 70.9% of NT women. Prevalence rates were higher in hypertensive patients (51 % in men and 81 % in women). When the new Egyptian WC cutoff points were used, a more realistic estimate of abdominal obesity prevalence was developed with 23.6% in NT men and 40.7% of NT women. Rates in HT men were 43.4% cm and HT women 55.9%. The prevalence of abdominal obesity in all the sample population was 37.1% for men and 50.8% for women[25].

**CARDIOMETABOLIC RISK FACTORS AND WAIST CIRCUMFERENCE**

- The relationship between the level of WC and cardiometabolic risk factors (CMRF) in Egyptians was examined in 305 normotensive males and 432 normotensive females.
- The following CMRFs were studied: level of fasting blood sugar (FBS), post prandial blood sugar (PPS), total cholesterol (TC), LDL-C, HDL-C, triglycerides (TG), prevalence (%) of diabetes, increased TG (> 150 mg/dl), increased LDL-C (> 160 mg/dl), increased TC (>240 mg/dl) and decreased HDL-C (< 40 mg/dl). Left ventricular mass index (LVMI) determined by echocardiography was included among risk factors.
- The sample was divided into six categories based upon the following WC levels: < 70, 70-79, 80-89, 90-99, 100-109, and more than 109 cm.
- The level of different risk factors and their prevalence (%) was compared between individuals with the smallest WC (< 70 cm) and those with the largest WC (> 109 cm) in both NT men and women (Tables 2 and 3).
- There was a positive trend between the WC measurements and the prevalence of majority of RFs studied and a significant difference between the smallest and largest WC categories.

When subjects were categorized according to the absence and the number of risk factors, there was a significant positive correlation between WC and the increasing number of risk factors in both men and women as seen in figure (3). In females without CMRFs the average WC was 78 cm while in those with more than 3 RFs, it was 100 cm. Similarly, in males without RFs, average WC was 80 cm, but in those with more than 3 RFs, it was 104 cm.

*Figure (3): Waist Circumference and Magnitude of Risk among Egyptians: number of risk factors*




*Source: Egyptian NHP (1991-1994)*

Based on this information, one might predict that in the coming years, a simple measure of WC is likely to be used in routine clinical practice and in the early diagnosis of cardiometabolic risk. It is possible that physicians may move away from BMI and turn to their measuring tapes to probably evaluate CVD risk in their patients.

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