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Original

Waist circumference as indicator of cardiovascular risk

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Abstract

Background: Obesity affects more that 60% of Costa Rican adults. There is consensus on the fact that fat accumulation in the intra-abdominal region is a risk for cardiovascular disease, and that the measurement of waist circumference is an indirect indicator used for its identification. The objective of the present study was to use this measurement to describe the characteristics of the urban population and its stratification according to the risk level of suffering cardiovascular diseases.

Methods: The study´s population consisted of 325 adults (76.9% women), ages between 20 and 44 years old; residents of the Santa Ana Health Area, which were at home at the time of the regular visit of the primary health care technician.

Results: Average age was 30±6.5 years; 50.1% were housewives and 40.9% had elementary schooling. The mean of the waist circumference among women was 86.4±12.4 cm and 88.1±11.5cm among men; this value increases to more than 88 cm and more than 102 cm, respectively, if the population at risk is excluded. According to the cutting points of the WHO, the population at risk was 57.5%, out of which 31.1% presented high risk values (WC > 88 cm in women and 102 cm in men), and this increased with age.

Conclusion: The structure at the primary level allows measuring the waist circumference at home, as a simple and practical method to identify the population at risk.

Keywords: Waist obesity, waist circumference, Primary Health Care, cardiovascular diseases.

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Study made in Área de Salud de Santa Ana

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Cardiovascular diseases represent the main cause of death worldwide.[1] In Costa Rica, in 2010 the produced 3 928 deaths, which accounts for 20% of deaths (55% in men and 45% in women).[2] The main risk factors for these diseases have increased in recent years, according to national surveys; the prevalence of overweight and obesity is 60% (IMC≥25); high cholesterol id of 45,7% (>200 mg/dl), and high triglycerides of 29,8% (≥200 mg/dl). Also, 25,6% of the population presents arterial hypertension (≥140/90 mm/ Hg) and over 8%, of diabetes.[3, 4] From these risks factors, obesity acquired great relevance because it accelerate its appearance, especially if the excess of fat deposits inside the abdomen. The excess of intraabdominal fat produces metabolic alterations that increase the risk of cardiovascular diseases. One of the reasons for this, it's possibly that the intraabdominal fat possessed a different physiological response than that from the subcutaneous fat, making it more susceptible to lipolytic stimuli and increment of free fatty acids in portal circulation.[5-12]

Another reason is the deregulation in the production of cytokines, due to fat excess, that increases a state of chronic inflammation that leads to insulin resistance.[13] There is a consensus about waist circumference measurement as a indirect indicator of presence of intraabdominal fat. It's easy to obtain and have a low cost, sue to this, it is used to predict early the risk of diseases such as diabetes mellitus, hypertension and cardiovascular diseases, and provides useful information to identify the risk population, even before the obesity is identify with BMI (Body Mass Index).[14,15] However, for this measurement to be useful and reliable, it is necessary the existence of measurement and standardization protocols to the staff that performed this measurements, in order to avoid errors that could affect the risk classification with the obtained data.[16]

There are various criteria to evaluate the risk of cardiovascular diseases, in relation to the value of abdominal circumference; the Adult Panel Treatment III (APT-III) established a values of ≥80cm in women and ≥94cm in men, to define abdominal obesity or incremented risk.[9,17,18] The International Diabetes Federation (IDF) established values of ≥90cm in men and ≥80cm in women.[19] In 1997, World Health Organization (WHO) proposed cut points to identify people in risk into three categories, "very low" ≤79cm in women and ≤93cm in men; "incremented risk" from 80 to 87cm in women and from 94 to 101cm in men, and "high risk" ≥ 88 cm in women and ≥102cm in men.[20] There is controversy over appropriate cut values for different ethnic groups.[9,16]

In Costa Rica, the indication for measurement of waist circumference is establish in guides for the attention of diabetic and hypertensive individuals.[21] However, it is not considered as a primary care activity in Basic Health Care Crew (Equipos Básicos de Atención en Salud - EBAIS), with an essential function in health promotion and disease prevention. Each EBAIS is composed of a doctor, a nurse and a primary health care technician (ATAP); distributed over the country and attends from 3500 to 5000 habitants each.[21] Due to this, an opportunity was identify to include the measurement of waist circumference in daily routine activities of ATAP's during home visits, in order to identify the population in risk and refer them to local interventions in health prevention and promotion.

The objective of this article is to describe the characteristics of the population in Santa Ana Health Care Area, to whom the waist circumference were taken and stratification according to the risk of cardiovascular diseases was made.

Methodology

Cross-section descriptive studies made in January 2009 and December 2010 in Santa Ana Health Care Area, Costa Rica, integrated by 10 EBAIS. Adult men and women were evaluated in age ranges from 20 to 44 years old, usual residents that were found at home during home visit by ATAP's performed between 7am to 12md. Pregnant women, women in 4 months postpartum period, posterior to abdominal surgery or with some kind of physical disability that made measurement impossible.

ATAP's were trained and standardized in the process of measurement based on "manual de procedimiento para la medición de la circunferencia abdominal" (Waist circumference measurement procedure manual), designed with this purpose.[21] Fiberglass, inextensible measurement tapes, graduated in centimeters, and sensible to millimeters, calibrated by Costa Rican Measurements Laboratory (LACOMET, certified number 22010109).

The analyzed variables were: age in years, genre, level of schooling, occupation and waist circumference; and WHO classification was used.[20] The occupation of remunerated activities were classified according to the International Labour Organization (ILO).[23] Descriptive statistics and the analysis of the association of different variables with the level of risk were made with SPSS program, ver. 15.0 for Windows. The level of statistical significance was of $p<0,05$.

Results

The results of 325 people, 76,9% were women, with an average age of 30±6,5 years, similar in both genre. 74,2% of the population were under 35 years old. According to the level of schooling, 40,9% of the population had primary education (complete or incomplete), 46,1% had middle education (complete or incomplete), 11,1% had college studies and 1,8% were illiterate. 50,1% were housewives, and 47,7% had remunerated activities, mainly services, commerce, operator workers and artisans; 72,6% of the population were married or live in cohabitation.

The average waist circumference measurement in women was of 86,4±12,4cm, and of 88,1±11,5cm in men. There was no statistical significance between waist circumference means by genre ($p=0,282$). There was an increase of waist circumference in women according to age, up to 39 years old, with and statistical significant differences ($p= 0,03$); in men, there was no ascendant change in age groups, but it was statistically significant ($p=0,04$). (Table 1).

Table 1. Average waist circumference, according to genre and age group, INCIENSA-COOPESANA, 2010. n=325

Age group	n	Average	Standard Deviation
Male			
20 - 24 yo	22	81,46	7,65
25 - 29 yo	21	93,02	16,38
30 - 34 yo	18	86,79	6,19
35 - 39 yo	8	94,63	9,49
40 - 44 yo	6	90,90	3,48
All ages	75	88,13	11,52
Female			
20 - 24 yo	57	82,16	13,42
25 - 29 yo	65	86,37	10,31
30 - 34 yo	58	87,19	11,26
35 - 39 yo	40	89,69	14,56
40 - 44 yo	30	88,60	12,41
All ages	250	86,40	12,43

According to WHO cut points, 57,5% (n=187), the population was classified with some risk degree (intermediate and high risks). From these percentage, 35,1% with high risks (43,2% women and 8% men) (Table 2).

The percentage of population in "high risk" category had increase in each age group especially in women, however, the major change in prevalence was in age group between 20-24 years old and 25-29 years old (Figure 1). In men, the most prevalent age group accounting for 85% (n=5) was that of ages 35-39. Excluding low risk individuals, an average waist circumference in women in all age groups was over 88cm and in men, only age group between 25-29 years old were over 102cm, placing them in high risk category (Table 3).

Discussion

Waist circumference is a easy to determine tool and of great use in clinical practice, and as a product of study, the measurement of the waist circumference was included in health promotion and prevention in primary care attention.

The population in this study was characterized with a majority of individuals being young women, with level of schooling no higher than middle school, and housewives, indicators of low socioeconomically status. Also, the waist circumference placed them in risk of diseases such as diabetes and hypertension; the results on other studies indicate that obesity problems is a higher and more accentuated in low

Table 2. Classification according to genre-circumference INCIENSA-COOPESANA, 2010 n=325

Category	Women	Men	Total
Low Risk	82 (32,8%)	56 (74,7%)	138 (42,5%)
Incremented Risk	60 (24,0%)	13 (17,3)	73 (22,5%)
High Risk	108 (43,2%)	6 (8,0%)	114 (35,1%)
N	250	75	325

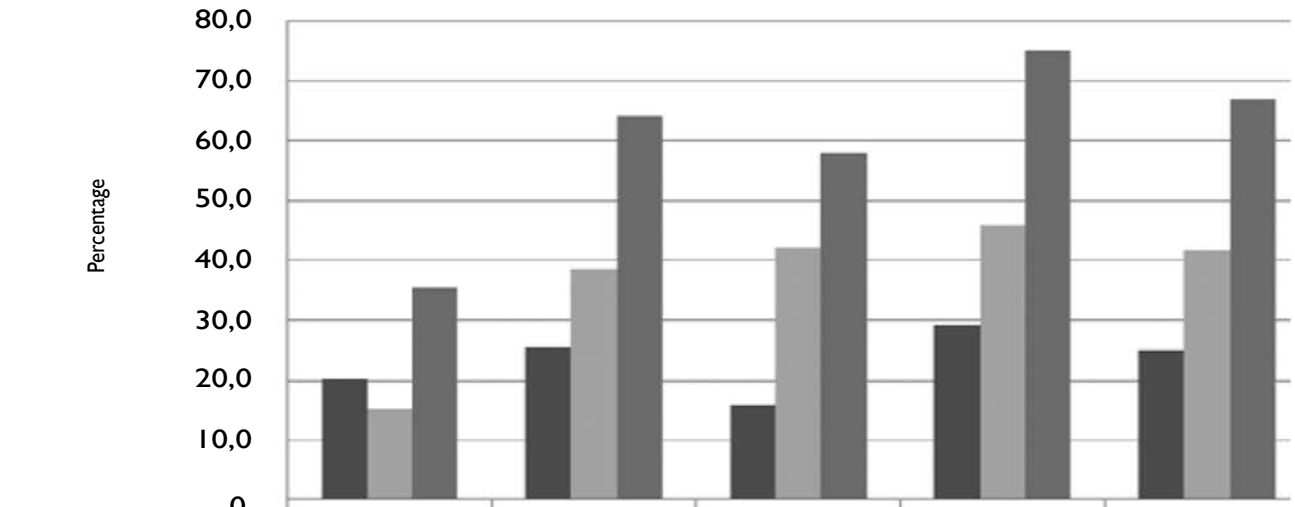
Low risk= women < 79 cm, men <93 cm, incremented risk= omens 80-87 cm, men 94-101 cm, high risk= women > 88 cm, men > 102 cm

socioeconomically status.[24, 25] The profile of individuals in this study, in addition to high values of waist circumference, can explain the high prevalence of diabetes in women in Costa Rica, shown in national surveys.[3, 4]

A survey of "diabetes, hypertension and risk factors for chronic diseases" performed in 2004, used WHO waist circumference risk factors values, that showed a group with ages between 20-39, and a prevalence of 44,8% in women and 17% in men.3, 4 In this study, the prevalence in women was similar (43%), but lower in men (8%). Excluding all individuals without risk factors, the waist circumference risk value exceeded in all age groups, especially groups between 20-24 years old and 25-29 years old, suggesting that prevention measurements for cardiovascular diseases should be prioritize in younger groups, in order to prevent the onset of diseases, and abdominal fat between genre vary, being higher in women.24 Among older women, an increase in androgyny, shown by levels of testosterone, produce an accumulation of abdominal adipose tissue, that increases the activity of hepatic lipase, and decrease consequently the levels of HDL, making waist circumference a simple indicator to evaluate lipid metabolism in primary care.[18, 26]

International organizations (APT, ADF and WHO) use different criteria to classify population in risk, concurring with the cut point of 80cm in women, but not in men. Many authors recommend reevaluate the cut values of 102cm in men, in order to avoid lately interventions; so that in this study 19 more men could be classify in the risk category according to IDF. [9,27]

One limitation in these results is that the type of population were found in households were not representative of the general population, since visiting hours were made in the morning, family members that were not at home were especially men. The limitation were for all activities in home visits, therefore other strategies must be sought to capture this population, and a possible site would be the local job centers.



	20-24 yo	25-29 yo	30-34 yo	35-39 yo	40-44 yo
Incremented Risk	20,25	25,58	15,79	29,17	25,00
High Risk	15,19	38,37	42,11	45,83	41,67
Total	35,44	63,95	57,89	75,00	66,67

Figure 1. Percentage of individuals classify with waist circumference risk *, according to age group. INCIENSA-COOPESANA, 2010 * Incremented Risk= women 80-87 cm, men 94-101 cm High risk= women > 88 cm, men > 102 cm.

In conclusion, this indicator is practical, non invasive, and accepted by all users and health care givers, and it can be used in prevention at community level;[28] it allowed the identification of population in risk, that due to a younger age were not in demand for cardiovascular diseases, but could be include in local interventions in health promotion and prevention in primary care attention.

Table 3. Waist Circumference Risk average, according to genre and age group INCIENSA-COOPESANA, 2010 n=325

Age group	n	Average	Standard Deviation
Female			
20 - 24 yo	26	92,71	12,470
25 - 29 yo	47	90,89	8,143
30 - 34 yo	42	92,49	8,073
35 - 39 yo	30	94,89	12,987
40 - 44 yo	23	92,95	10,780
Male			
20 - 24 yo	2	96,50	2,121
25 - 29 yo	8	110,20	12,970
30 - 34 yo	2	95,20	-
35 - 39 yo	6	98,20	5,918
40 - 44 yo	1	97,50	-

* Waist Circumference Risk= women > 80 cm, men > 94 cm

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