Endocrinol Diabetes Nutr. 2017;xxx(xx):xxx–xxx

Endocrinología, Diabetes y Nutrición

www.elsevier.es/endo

ORIGINAL ARTICLE

Appropriate neck circumference cut-off points for metabolic syndrome in Turkish patients with type 2 diabetes

Ismail Ozkaya[a,*], **Bulent Yardimci**[b], **Aydin Tunckale**[c]

[a] *Department of Nutrition and Dietetics, Kirklareli Universty Health School, Kırklareli, Turkey*
[b] *Department of Internal Medicine, Istanbul Florence Nightingale Hospital, Istanbul, Turkey*
[c] *Department of Internal Medicine, Division of General Internal Medicine, Istanbul Bilim University, Faculty of Medicine, Istanbul, Turkey*

Received 23 February 2017; accepted 28 July 2017

KEYWORDS
Obesity;
Neck circumference;
Metabolic syndrome;
Cut-off point

Abstract
Objective: To investigate the association between neck circumference (NC), overweight, and metabolic syndrome (MS) in Turkish patients with type 2 diabetes.
Methods: A total of 264 diabetic patients (mean age: 52.9 ± 8.1 years) were recruited from two centers in Istanbul to perform anthropometric measurements, including waist and hip circumference, NC, and body mass index. Blood pressure, fasting glucose, and lipid profile (total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and triglyceride levels) were determined.
Results: NC correlated with waist circumference, systolic blood pressure, and triglycerides in men, whereas NC only correlated with waist circumference in women. Additionally, NC was shown to negatively correlate with high-density lipoprotein cholesterol in both men and women. Receiver operating characteristic analysis showed that the area under the curve for NC and overweight was 0.95 for both men and women ($P < 0.001$). Moreover, a NC of 38 cm for men and 37 cm for women was the best cut-off point for determining overweight. The area under the curve for NC and MS was 0.87 for men and 0.83 for women ($P < 0.001$). A NC of 39 cm for men and 37 cm for women was the best cut-off point to determine participants with MS.
Conclusions: Our findings suggest a positive correlation of NC with MetS in Turkish patients with type 2 diabetes, and could be a useful and accurate tool to identify MS.

* Corresponding author.
E-mail address: dytismail@hotmail.com (I. Ozkaya).

http://dx.doi.org/10.1016/j.endinu.2017.07.006

Please cite this article in press as: Ozkaya I, et al. Appropriate neck circumference cut-off points for metabolic syndrome in Turkish patients with type 2 diabetes. Endocrinol Diabetes Nutr. 2017. http://dx.doi.org/10.1016/j.endinu.2017.07.006

PALABRAS CLAVE
Obesidad;
Perímetro del cuello;
Síndrome metabólico;
Punto de corte

Puntos de corte del perímetro del cuello apropiados para el síndrome metabólico en pacientes turcos con diabetes tipo 2

Resumen
Objetivo: Investigar la asociación entre el perímetro del cuello (PC), el sobrepeso y el síndrome metabólico (SM) en pacientes turcos con diabetes tipo 2.
Métodos: Se reclutó un total de 264 pacientes diabéticos (edad media: 52,9 ± 8,1 años) de 2 centros de Estambul a quienes se realizaron medidas antropométricas, incluidas las de los perímetros de la cintura y la cadera, el PC y el índice de masa corporal. Se determinaron la presión arterial, la glucosa en ayunas y el perfil lipídico (colesterol total y de las lipoproteínas de alta y baja densidad y triglicéridos).
Resultados: El PC se correlacionaba con el perímetro de la cintura, con la presión arterial y con los triglicéridos en los varones, pero solo con el perímetro de la cintura en las mujeres. Se comprobó además una correlación negativa del PC con el colesterol de las lipoproteínas de alta densidad tanto en varones como en mujeres. El análisis de las características operativas del receptor mostró que el área bajo la curva del PC y el sobrepeso era de 0,95 tanto en varones como en mujeres ($p < 0,001$). Además, un PC de 38 cm en varones y de 37 cm en mujeres era el mejor punto de corte para determinar los participantes con sobrepeso. El área bajo la curva del PC y el SM era 0,87 en los varones y de 0,83 en las mujeres ($p < 0,001$). Un PC de 39 cm en varones y de 37 cm en mujeres era el mejor punto de corte para determinar los participantes con SM.
Conclusiones: Nuestros hallazgos indican una correlación positiva del PC con el SM en los pacientes turcos con diabetes tipo 2, que podría ser una herramienta útil y exacta para identificar el SM.

Background

Metabolic syndrome (MetS) is a condition, which causes an increase in cardiovascular mortality and morbidity.[1–3] In 2005, IDF (International Diabetes Federation) defined MetS, which is appropriate for clinical use worldwide,[4] as central obesity plus two of the following four additional factors: elevated plasma triglycerides (TG), reduced high-density-lipoprotein-cholesterol (HDL-C), elevated blood pressure (BP), and elevated fasting plasma glucose (FBG).[4] Based on this definition, central obesity is an absolute necessity for MetS and is determined by waist circumference (WC) values. The cutoff points for central obesity in Europeans were ≥94 cm for males and ≥80 cm for females.[4]

In 2009, IDF/IAS (International Atherosclerosis Society)/IASO (International Association for the Study of Obesity) established the most recent MetS criteria.[5] It was agreed that central obesity should not be an obligatory component for determining MetS however; WCs should be continued to be used a useful preliminary screening tool. Three out of the five abnormal findings would be considered for qualifying a person with MetS. In this report, different WC cutoff points were defined for national or regional populations.[5]

Already, it has been demonstrated that there is a strong correlation between neck circumference (NC) and WC and that it may be used as an indicator of central obesity.[6–11] In addition, the association between NC and MetS has also been revealed in different communities.[12–19] Similarly, Onat et al.[20] determined the association between MetS and NC in the Turkish population and defined a cutoff value. However, no study has been conducted to determine the association between NC and MetS in type 2 diabetes to date.

Therefore, the aim of this study was to evaluate the association between NC and MetS and to establish cutoff values of NC for the prediction of MetS in Turkish type 2 diabetic patients.

Methods

In this study, a total of 289 type 2 diabetic patients were enrolled between January and December 2015 from the outpatient clinics of internal medicine at a Istanbul University Cerrahpasa Faculty of Medicine and Istanbul Florence Nightingale Hospital in Istanbul. Written informed consent was obtained from all participants, and the study was approved by the institutional review board and complied with the Declaration of Helsinki. Past medical history was determined using a standardized questionnaire.

Participants with a history of thyroid disease and malignancy ($n = 3$), pregnancy ($n = 1$), liver failure ($n = 1$), renal failure ($n = 1$), heart failure ($n = 1$), goiter ($n = 5$), females undergoing hormone replacement therapy ($n = 1$) and diabetic patients with bad metabolic control (>7.5% HbA1c) ($n = 12$) were excluded. Ultimately, the evaluation was made using 264 patients (134 women and 130 men).

Blood pressure (BP) was measured twice after each participant had been seated for 10 min, and the average was used for analysis. Anthropometric measurements, including height, weight, WC, hip circumference, and NC, were

Please cite this article in press as: Ozkaya I, et al. Appropriate neck circumference cut-off points for metabolic syndrome in Turkish patients with type 2 diabetes. Endocrinol Diabetes Nutr. 2017. http://dx.doi.org/10.1016/j.endinu.2017.07.006