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Age Cut-off Point for the Diagnosis of Metabolic Syndrome in Northern Adult Iranians: A New Approach in Prevention

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Study Area: Kordkuy & Kalaleh district of
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Coordinate: 36°41'30"N 54°12'00"E; & 37°22'51"N
55°29'30"E

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Abstract

The Metabolic syndrome (MetS) is one of the main risk factor for cardiovascular disease and the aim of this study was to compare the discriminative capacity of age in a prediction of non-adipose components and to determine its relevant optimal cut-off in Turkman and non-Turkman residents of the northern part of Iran. This study has been conducted on the 248 subjects of 25-70 years age. ATP-III method was used for diagnosis of MetS. The optimal cut-off, the corresponding sensitivity and specificity for age have estimated in the threshold that maximizes the sum of sensitivity and specificity or equivalently maximizes in ROC curve operating points. Finally, the prevalence of MetS was evidenced in 37.6% of subjects and significantly was 14.7% more in non-Turkman than in Turkman group. Compared with Turkman group, the means of fasting plasma glucose, Triglycerides, WC and diastolic blood pressure (DBP) were statistical significantly more in non-Turkman group, respectively. Age cut-off values for predicting of MetS was 33.5 years in Turkman, 50.5 years in non-Turkman and 42.5 years in total of subjects. The AUCs (Area Under Curve) ranged from 0.546 in Turkman group to 0.726 for the non-Turkman group.

Introduction:

The Metabolic syndrome (MetS) as a main risk factor increased cardiovascular disease (CVD) two times as compared to the other agents (Lakka *et al.*, 2002; Sattar *et al.*, 2003). The risk related with MetS is greater than the sum of the risks resulting from its component features (Kahn *et al.*, 2005; Fakhrzadeh *et al.*, 2004). However, MetS is helpful in predicting the incidence of coronary heart disease (Wannamethee *et al.*, 2005).

In last decades, changes in lifestyle and food behaviors increases manifolds the cases of diabetes, CVD and MetS especially in developing countries in worldwide (Alwan, 2011). Although several definitions established for MetS but the IDF (International Diabetes Federation) and ATP III (Adult Treatment Panel III) are the most practical methods (Grundy *et al.*, 2005; Alberti *et al.*, 2005) and consequently, the prevalence of it may be different in population.

Golestan province is located on the northern part of Iran (South-east of Caspian sea) and among 1,7 million people, 43.9% live in rural areas and engaged in

agricultural work. Some ethnic groups have also been living in this particular zone as Fars-native, Turkman and Sistani (SCI, 2012).

In Iran, besides cardiovascular disease (Malek *et al.*, 2006), hypertension (Veghari *et al.*, 2013a) hypercholesterolemia (Veghari *et al.*, 2013b) and obesity (Veghari *et al.*, 2012; Veghari *et al.*, 2010a,b; Veghari *et al.*, 2013c) have been reported in the northern part of Iran. In addition, lifestyle and food behavior were different among ethnic groups in the north of Iran (Veghari *et al.*, 2013c).

Area under the receiver operating characteristic curve (ROC) is well thought-out as an effective measure of inherent validity of a diagnostic test. This curve is useful in evaluating the discriminatory ability of a test to properly select diseased and non-diseased subjects; finding optimal cut-off point to the smallest amount misclassify diseased or non-diseased subjects; comparing two or more observers measuring the same test (inter-observer variability) and comparing the efficacy of two or more tests for assessing the same disease (Kumar & Indrayan ,

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2011).

In spite of high prevalence of MetS in the northern part of Iran (Veghari *et al.*, 2015) and positive association with age, there is no regional optimal cut-off values of age for predicting of MetS in this area. The capacity of age information is useful for assessing of MetS. In this regard, the main aim this study was to compare the discriminative capacity of age in prediction of non-adipose components and to determine its relevant optimal cut-off in Iranian northern adults based on ethnicity.

Methodology:

This study was approved by Ethical Research Committee and consent was received from all participants.

On the basis of the previous study (Sharifi *et al.*, 2009) the essential sample size with estimation of 20% MetS rate; a confidence level of 95% and a maximum marginal error 0.05, was calculated in 246 cases and this study has been carried out on the 248 subjects aged 25-70 years. Individuals were chosen from 25 clusters and each cluster comprised 10 cases. Both clusters and individuals were chosen randomly from two districts (Kordkoy and Kalaleh) in Golestan province (northern part of Iran and towards southeast of Caspian Sea). A educated staffs team was involed to tabulate the data for three months. Pregnant women and the person refused to participate in the study were excluded from this study. The proportions of Turkman and non-Turkman ethnic groups were 88 (35.5%) and 160 (65.5%), respectively.

Waist circumferences (WC) were measured to the nearest 0.5 cm at the superior border of the iliac crest with the subject standing, at the end of normal breathing; blood pressure was measured by a mercury sphygmomanometer for three times and 5 ml of venous blood drawn after 8-12 h fast in the morning for laboratory test. Biochemical analysis including fasting blood glucose, triglyceride and HDL-cholesterol was assessed by using a commercially kit (Pars Azmoon, Karaj, Iran). The ethnic groups consist of two groups: 1) Turkman: The inter marriage of this ethnic group with others was rare and this group can be distinguished by phenotype. 2) non-Turkman: Included all of ethnic groups (except Turkman) that living in this area. ATP-III method was used for diagnosis of MetS (Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, 2001). According to this criteria, the presence of at least three of five the following criteria were included as MetS: (I) HDL cholesterol <40 mg/dl in men and <50 mg/dl in women; (II) Abdominal obesity as measured by WC >102 cm in men and >88 cm in women; (III) Triglycerides >150 mg/dl; (IV) SBP-systolic blood pressure=130 or DBP-diastolic blood pressure=85 mm/Hg; (V) fasting plasma glucose (FBG)=110 mg/dl.

SPSS 16.0 software (Chicago II, USA) was used for the statistical analysis using chi-square test and t.test for

comparing frequencies and the means, respectively. P-value < 0.05 considered statistically significant. The optimal cut-offs and the corresponding sensitivity and specificity for age was estimated in the threshold that maximizes the sum of sensitivity and specificity or equivalently maximizes in ROC curve operating points.

Results:

Finally, the prevalence of MetS was found as 37.6% and which was significantly up 14.7% more in non-Turkman group than in Turkman group ($p < 0.015$). While compared with Turkman group, the means of fasting plasma glucose, Triglycerides, WC and diastolic blood pressure (DBP) were 15.8 mg/dl, 28.8 mg/dl, 6.4 cm and 3.6 mm/hg more in non-Turkman group, respectively and all such parameters differed statically ($p < 0.05$ for all). Further, HDLc was found 5 mg/dl higher in Turkman group than in non-Turkman group ($p < 0.006$) (Table 1).

Table 1: Basic characteristics of the subjects

Criteria	Total Mean (95%CI)	Tm Mean (95%CI)	N-Tm Mean (95%CI)	P.V.
Age(year)	46.3 (44.5-48.2)	43.8 (41.2-46.6)	47.7 (45.6- 49.7)	0.035
FBG(mg/dl)	98.6 (94.2-104.4)	88.5 (85.65-91.2)	104.3 (96.8-113.1)	0.001
TG(mg/dl)	146.0 (135.3-157.8)	127.5 (112.7-146.1)	156.3 (141.0-171.1)	0.022
HDLc(mg/dl)	50.8 (49.1-52.6)	54.1 (50.9-57.0)	49.1 (47.0-51.4)	0.006
Waist circum- ferece(cm)	95.4 (93.6-97.2)	91.3 (88.2-94.9)	97.7 (95.5-99.8)	0.001
BP_dias (mm/hg)	82.1 (80.5-83.6)	79.8 (77.0-82.6)	83.4 (81.3-85.5)	0.032
BP_sys (mm/hg)	127.9 (125.3-130.7)	125.0 (120.9-129.3)	129.5 (125.8-133.8)	0.130
MetS (Prevalence)	94.0 (37.9)	25.0 (28.4)	69.0 (43.1)	0.015
Male/Female	101/147	34/54	67/93	

CI= Confidence Interval; Tm- Turkman; N-Tm- Non-Turkman

In general, the positive and significant association was seen between age and MetS morbidity ($p < 0.001$, $r = 0.287$). However, this association was not significant in Turkman group. Age cut-off values for predicting MetS was 33.5 years in Turkman, 50.5 years in non-Turkman and 42.5 years in total of subjects.(Table 2) The AUCs ranged from 0.546 in Turkman group to 0.726 for non-Turkman group. The values for AUC tended to be higher in non-Turkman and in total of subjects. (Graph1).

Discussion and conclusions:

High prevalence of MetS was seen in our study especially in non-Turkman group. Earlier, the obesity and MetS were reported to depend on ethnicity and gender which prevalent more in the Russians than in the Chuvashes

Table 2: The area under ROC curve (AUC), optimal cut-off values of age with MetS

Ethnicity	MetS	Age Year Mean (95% CI)	P.V	Cut off of age (Year)	Correlation coefficients	AUC	P-Value
Turkman	Yes/No	44.9(39.6-50.0)/43.5(40.2-46.9)	0.660	33.5	0.048	0.546	0.660
Non-Turkman	Yes/No	53.7(50.8-56.5)/42.9(40.4-45.5)	0.001	50.5	0.385	0.726	0.001
Total	Yes/No	51.3(48.7-53.7)/43.2(41.1-45.3)	0.001	42.5	0.287	0.675	0.001

Figure- 1: Receiver operator characteristics curves of age for detection of metabolic syndrome in, Total, Turkman and non-Turkman.

population in Chuvash Republic (Markova et al., 2014). Nevertheless, the MetS components values were reported to be different between Roma and non-Roma subjects in the eastern part of Slovakia (Fedacko et al., 2014). Earlier studies conducted on the northern part of Iran obesity was found less in Turkman group than in Fars-native group (Veghari & Mansurian, 2007; Veghari et al., 2010b). The lifestyle and food behaviors were already reported to be different in regional Turkman people while compared with other ethnic groups in the north of Iran (Veghari et al., 2010a; 2013a). These differences may influence the cardiovascular risk factors varieties. However, a comprehensive study is necessary to determine the MetS substantial factors among ethnic groups living in the northern part of the Iran.

In our study, the cut-off point of age for MetS was 42.5 years and the same was found to be more in non-Turkman than in Turkman group. Some studies evidenced the high prevalence of MetS in the older person (Kotani et al., 1994; Rosano et al., 2007). In another study (Kuk & Ardern, 2010) MetS was prevalent twice on the subject of age group >65 years while compared with the subject of age group <25 years. The MetS rate differs with age and gender change (Grundy et al., 2004; Alberti et al., 2009). The different cut-off point of WC for MetS was seen in different ethnic groups in African especially in men (Hoebel et al., 2013). In addition, the prevalence of MetS and some other related factors were reported to vary in some studies among different ethnic groups (Veghari et al., 2010b; Markova et al., 2014; Fedacko et al., 2014; Veghari & Mansurian, 2007; Ford et al., 2002; Guo et al., 2014). The cut-off point of age for MetS had also not been reported in previous studies, however outstanding result of our study was the determine of age cut-off for MetS based on ethnic groups. In that case, the starting age of MetS in non-Turkman was less than in Turkman group.

The gender differences and a proper statistical test for considering of design effect caused by cluster sampling have not used in present study. They are our limiting study factors. Conclusively, MetS is a health problem among the people living in northern part of Iran and it is more in non-Turkman than in Turkman groups. Age cut-off values for predicting of MetS was less than in Turkman groups. The likelihood of metabolic syndrome in non-Turkman than in Turkman adults' people was 20 years earlier.

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