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Prevalence of Abdominal Obesity in the Aboriginal and non- Aboriginal population of Yakutsk Aged 60 and Older

G.I. Simonova, K.K. Sozonova, O.V. Tatarinova, Y.P. Nikitin

ABSTRACT

Aim: to study the prevalence of abdominal obesity among the elderly and senile (including long-lived people) population of the city of Yakutsk, and to determine waist circumference cutoff values associated with the components of the metabolic syndrome (MS) in the Yakut and non-aboriginal population aged ≥60 years.

Material and methods: The study of the prevalence of abdominal obesity (AO) was done based on representative sample comprising 485 citizens (210 males and 275 females), aged 60 or over.

Results: Mean values of waist circumference (WC) in Yakuts were smaller (90.5 sm.), than in the non-aboriginal population (94.1 sm.). Prevalence of AO in the total study population was 42.9% (95% CI 38.5–47.4) using NCEP ATP III (2001) criteria, or 65.2% (95% CI 60.8–69.3) using RSC (2009) criteria. All WC cutoff values used were associated with less prevalence of AO in the aboriginal population, compared to non-aboriginal population: 32.9% in Yakuts and 52.4% in non-aboriginal patients using WC cutoff value of ≥102/88 sm., and 58.2% and 71.8%, respectively, using WC cutoff value of ≥94/80. Mean WC cutoff points associated with the 5 components of the metabolic syndrome (arterial hypertension (AH), hypertriglyceridemia (hTG), low HDL cholesterol (hypo-HDL-C), fasting hyperglycemia (5.6 mmol/L)) were 83.0 sm. in aboriginal males, 92.6 sm. in aboriginal females, 97.1 sm. in non-aboriginal males, and 93.1 sm. in non-aboriginal females.

Keywords: epidemiology, metabolic syndrome, abdominal obesity, waist circumference, ethnicity.

INTRODUCTION

Numerous cohort studies have shown that obesity plays a role as an important predictor of all death causes, and cardiovascular death [9]. In Novosibirsk, large-scale epidemiological studies have been conducted since mid-80s of the XX century. Data on high prevalence of risk factors for cardiovascular diseases among the population aged 25-64 had been reported from 1984 to 1995, as part of the WHO project MONICA (Principal Investigator in Novosibirsk center: Y.P. Nikitin). The risk factors included overweight and obesity [3]. National Health and

Nutrition Examination Surveys (NHANES) conducted in 2001-2002 have revealed ethnic-dependent variation in the incidence of obesity in Americans. This correlation was true for females, but not for males. The highest incidence of overweight was found in African American females (68.6%), with a slightly lower incidence in Caucasian (56%) and Mexican females (54.5%) [13]. In Europe, the situation with obesity has been more favorable. For example, in Great Britain 37% of males and 24% of females had overweight; obesity was present in 17 and 19.5%, respectfully. Finland has the lowest registered incidence of obesity among the countries of European Community (19% in males and 18% in females) [15]. Furthermore, based on the findings from some epidemiological studies, not just the presence of obesity, but the type of body fat distribution as well, influences overweight-related complications [4]. The predominating role of abdominal obesity can be explained by its stronger "pathogenicity". Moreover, obesity acts not only as an independent aggressive factor, but is often associated with the other components of metabolic syndrome [1,4-6]. The prevalence of AO in the population of Novosibirsk aged 45-69 was 43% using the criteria of NCEP ATP III (2001), and 65% using the criteria of IDF (2005), IDF, AHA/NHLBI (2009), and RSC (2009) [7]. Significant ethnic variations (between European, Asian, American and other populations) are known to exist in the prevalence of metabolic syndrome, and in particular, its basic component, abdominal obesity. Ethnic and regional differences of AO have been increasingly studied during the last years [10-12,14,16]. The prevalence of MS and AO in the Asian part of the Russian Federation, where the population is ethnically very heterogeneous, is poorly studied to date, especially among the elderly and senile population. Hence epidemiological study of the prevalence of MS and its components (specifically, AO) in the elderly and senile population in Yakutia is an important basic & applied research task.

AIM: to study the prevalence of abdominal obesity among the elderly and senile (including long-lived people) population of the city of Yakutsk, and to determine waist circumference cutoff values associated with the components of the metabolic syndrome (MS) in the Yakut and non-aboriginal population aged ≥60 years.

MATERIAL AND METHODS: This paper presents data from the research project "Epidemiology and risk factors for some of the chronic non-infectious diseases in the elderly and senile (including long-lived people) in Yakutsk" (Principal Investigator: O.V. Tatarinova, Scientific Supervisor: Y.P. Nikitin, RAMS academician). This study was conducted under methodological guidance of the Institute of Therapy SB RAMS, Novosibirsk (Supervisor: Y.P.

Nikitin, member of the Russian Academy of Medical Sciences) (government contract no. 274). Cross-sectional population study design was used.

We studied the population of Yakutsk aged 60 and over. On January 1, 2005, there were 18 320 people aged 60 and over in Yakutsk. For the purposes of population study, a representative sample was formed, using Yakutsk electoral lists and computer random number generation. The sample comprised 970 individuals, who made up 5.3% of the total population of the city of Yakutsk, excluding the city suburbs. Next we verified the lists, confirming the home addresses, the places of residence and their correspondence to residence permits, and rechecking the data on the deceased persons. After verification, the total number of subjects in the sample was 775 individuals (response level was 79.9%).

The size of the sample for the study of the prevalence of MS made 491 person, and was calculated using M/Blend formula (2000), with 95% CI ± 4% around 30% estimated prevalence (according to data from publications). 485 persons were examined. All patients participating in the project gave informed consents for examinations. The study was approved by the Ethical Committee of the Yakutsk Scientific Center SB RAMS (record no. 26, 30 March, 2011). All patients were grouped by sex, age (60-69; 70-79; 80-89; 90 and over) and were divided to 2 groups by their ethnicity: aboriginal (Yakuts, n=237; 48.8%) and non-aboriginal (Caucasians: Russians, Ukrainians, Byelorussians, Poles, and Germans, n=248; 51.1%).

Examination included: assessment of social and demographic data, clinical assessment of health status, measurement of blood pressure, anthropometry, fasting biochemical tests (blood glucose levels, triglycerides (TG) levels, high-density lipoprotein cholesterols (HDL-C), and low-density lipoprotein cholesterols (LDL-C)). Standard screening methods were used, in compliance with the guidelines accepted in epidemiological studies [Rose G. et al., 1982; Oganov R.G., 1990].

Fasting blood was collected by vein puncture using vacutainers. After centrifugation, the serum samples had been stored for 1-3 months in low-temperature chamber at –70^{o}C until the day of test. Biochemical blood tests were performed in the Biochemistry Laboratory of the Institute of Therapy SB RAMS (Head of the laboratory: Professor YU.I. Ragino). Prevalence of MS was analyzed using the guidelines of NCEP ATP III (2001), RSC (2009), IDF (2005), AHA/NHLBI (2005), AACE (2003), and JIS (2009) [6,7].

Statistical analysis was performed using SPSS (ver. 11.5) software. Two-sample methods (Mann-Whitney U-test, paired Student t-test) were employed. ROC-analysis was performed. Sample normality was tested using Kolmogorov-Smirnov test. In case of incomparability of the

data the values were standardized for one or two characteristics. The results were considered significant if $p<0.05$.

RESULTS AND DISCUSSION

In the elderly (≥60 years) population of Yakutsk, mean WC values were similar in the first 2 age groups (94.4 and 94.3 sm.), but after 80 years of age, this value decreased to 88.0 sm. Distribution of WC values in aboriginal and non-aboriginal populations was slightly deviating from normal distribution (Kolmogorov-Smirnov test, $p<0.05$). Mean WC values for aboriginal population were: 90.2±12.7 sm. (Mean±SD), Mo=80.0 sm., Me=90.5 sm. Mean WC values for non-aboriginal population were: 94.3±13.8 sm. (Mean±SD), Mo=95.2 sm., Me=95.2 sm. 10% and 90% WC cutoff values were 73.0 sm. and 106 sm. for aboriginal patients, and 76.0 sm. and 110.1 sm. for non-aboriginal patients. Age-standardized mean WC values were significantly lower in aboriginal, than in non-aboriginal patients ($p_{A<NA=}0.003$) (Table 1). Interestingly, in aboriginal patients WC values did not change much between age groups, but in Caucasians WC values decreased markedly after 80 years of age.

Male aboriginal patients aged ≥60 had lower mean WC values, compared to non-aboriginal male population (91.0±11.3 sm. vs. 96.4±12.7 sm., $p_{A<NA}=0.01$), the same was true for WC values in women (89.3±14.1 sm. vs. 93.2±14.3 sm., $p_{A<NA}=0.025$, respectively).

Using WC cutoff value of ≥102/88 sm. (NCEP ATP III, 2001), abdominal obesity (AO_1) was present in 32.9% of the aboriginal patients, which was 1.5 times lower, than in non-aboriginal patients of the same age (52.4%, $p_{A<NA}=0.0001$) (Table). In the age groups of 60-69 and 70-79 these differences were more vividly pronounced, than in other age groups. In female population, the prevalence of AO_1 was 2 twice higher, then in male population ($p_{M<F}=0.0001$). In males, prevalence of AO_1 was twice lower in aboriginal, than in non-aboriginal population; likewise in females, AO_1 was 1.3 times less prevalent in aboriginal, than non-aboriginal females.

The same analysis of the prevalence of AO was done, using more strict WC cutoff value of >94/80 sm. (IDF and RSC). Using this definition, the prevalence of abdominal obesity (AO_2) reached 71.8% in non-aboriginal population (Table). In aboriginal patients, the prevalence is still high, but reliably lower, than in non-aboriginal patients (58.2%, $p_{A<NA}=0.002$). Prevalence of AO_2 decreased reliably with aging, both in aboriginal, and non-aboriginal populations, and in women more, than in men.

We used also JIS criteria of abdominal obesity (AO_3): WC >94 sm. for Caucasian males; WC >90 sm. for Asian males; WC >80 sm. for females (Table 2). As far as WC cutoffs for non-aboriginal males and females remained the same as in the above definitions of AO, all comparisons were done only with aboriginal males. Prevalence of AO_3 in the aboriginal cohort was 66.2%, which was close to prevalence in non-aboriginal population (71.8%, $p_{A-NA}=0.189$).

Analysis by age groups shows the absence of ethnic differences in the prevalence of AO_3 in males, although ethnic difference was present, when other WC cutoff values were used (in the total population and in the age group of 60-69) (Table).

The prevalence of AO in the population of Yakutsk aged ≥60 was high (ranging from 42.9% to 69.1%), using various definitions of MS. Prevalence of AO in the aboriginal population was lower, than in non-aboriginal population (in the age groups of 60-69, 70-79). AO was more incident in females, compared to males, independent of the ethnicity factor. In non-aboriginal patients, there was a decrease in the prevalence of AO after 80 years of age. Using WC cutoff values for Caucasian people (WC>94/80 sm.), the prevalence of AO was higher in non-aboriginal, than in aboriginal population. Using the WC of >94/80 sm. in combination with ethnicity-adjusted WC cutoff value for Asian males (WC≥90 sm.), the difference in the prevalence of AO between aboriginal and non-aboriginal populations was insignificant. Meanwhile, gender differences in the prevalence of AO remained the same, both in aboriginal, and non-aboriginal elderly and senile populations, with higher prevalence rates in females aged <80 years.

Concluding from the results of ROC-analysis, the most WC-value-sensitive factors were: AH defined as AP >130/85 mmHg in aboriginal and non-aboriginal males, and lipid levels (hypo-HDL-C and hyper-LDL-C in aboriginals; hypo-HDL-C in non-aboriginal) (Fig. 2). Mean WC cutoff values associated with the detection of all the 5 MS components (AH, hTG, hypo-HDL-C, fasting hyperglycemia (5.6 mmol/L)) in the population aged ≥60 were: 83.0 sm. for aboriginal males, 92.6 sm. for aboriginal females, 97.1 sm. for non-aboriginal males, and 93.1 sm. for non-aboriginal females.

CONCLUSIONS:

1. Mean WC values are lower in the aboriginal aged ≥60 years (90.5 sm.), than in non-aboriginal population (94.1 sm.).
2. Prevalence of AO in the total population aged ≥60 was 42.9% (95% CI 38.5–47.4), using NCEP ATP III (2001) criteria, and 65.2% (95% CI 60.8–69.3), using RSC (2009) criteria.
3. AO frequency for all the WC studied criterion in the indigenous aged60-80 years is lower relative to non-indigenous residents over the age of 80 years – in the indigenous substantially unchanged, while in the non-indigenous - is reduced and ethnic differences are smoothed.

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References:

1. Butrova S.A. Metabolicheskii sindrom i rol' abdominal'nogo ozhireniia v ego razvitii (voprosy patogeneza, proyavleniia, sovremennye podkhody k lecheniyu) [Metabolic syndrome and role of abdominal obesity in its development: issues in pathogenesis, manifestations, contemporary treatment approaches]. In: Dedov I.I., ed. Ozhirenie: Metabolicheskii sindrom. Sakharnyi diabet 2 tipa [Obesity: Metabolic syndrome. Type 2 diabetes mellitus]. Moscow; 2000. pp. 38-43.
2. Deev AD, Shal'nova SA. Massa tela u muzhchin i zhenshchin (rezul'taty obsledovaniia rossiyskoy, natsional'noy, predstavitel'noy vyborki naseleniya) [Body mass in men and women (results of the study of the Russian national representative population sample)]. Kardiovaskulyarnaya terapiya i profilaktika, 2008, no. 6, pp. 60-63.
3. Nikitin YU.P., Fedorova E.L., Simonova G.I. et al. Ishemicheskaya bolezn' serdtsa v zhenskoy popyalitsii g. Novosibirska: rezul'taty 7-letnego prospektivnogo issledovaniia [Ischaemic heart disease in female population of Novosibirsk: results of 7-year prospective study]. Kardiologiia, 1998, no. 7. pp. 12-15.
4. Kovaleva ON. Ozhirenie i risk serdechno-sosudistoi patologii u zhenshchin [Obesity and the risk for cardiovascular pathology in women]. 2009, vol. 9, no. 26.
5. Almazov V.A., Blagosklonnaya YA.V., Shlyakhto E.V. et al. Metabolicheskii serdechno-sosudistyi sindrom [Metabolic cardiovascular syndrome]. Saint-Petersburg; 1999. 202 p.
6. Nikitin YU.P., Kazeka G.R., Simonova G.I. Rasprostranennost' komponentov metabolicheskogo sindroma X v neorganizovannoy gorodskoy populyatsii (epidemiologicheskoe issledovanie) [Prevalence of the components of metabolic syndrome X in an urban unorganized sector population]. Kardiologiia, 2001, no. 9, pp. 37-40.
7. Simonova G.I., Mustafina S.V., Pechenkina E.A. Rasprostranennost' metabolicheskogo sindroma v Sibiri: populyatsionnoe issledovanie v g. Novosibirske [Prevalence of the metabolic syndrome in Siberia: population study in Novosibirsk]. Bulleten' SO RAMN, 2011, no. 5, pp. 100.
8. Shlyakhto E.V., Konradi A.O. Epidemiologiia metabolicheskogo sindroma v razlichnykh regionakh. Zavisimost' ot ispol'zuemykh kriteriev i prognosticheskoe znachenie

[Epidemiology of the metabolic syndrome in different regions. Correlation with the used criteria and predictive value]. Arterial'naia gipertenziia, 2007, vol. 13, no. 2, pp. 95-112.

9. Manson J.E., Willet W.C., Stampfer M.J. et al. Body weight and mortality among women. N. Engl. J. Med., 1995, vol. 333. pp. 677-685.
10. Alberti K.G.M.M., Eckel R.H., Grundy S.M., et al.; National Heart, Lung, and Blood Institute; American Heart Association; World Heart Federation; International Atherosclerosis Society; and International Association for the Study of Obesity. Harmonizing the Metabolic Syndrome. A Joint Interim Statement of the International Diabetes Federation Task Force on Epidemiology and Prevention, Circulation, 2009, vol. 20, pp. 1640-1645.
11. Mansour A.A., Al-Hassan A.A., Al-Jazairi M.I. Cut-off for waist circumference in rural Iraqi adults for the diagnosis of metabolic syndrome. Rural and Remote Health, 2007, vol. 7, pp. 765.
12. Miyatake N., Wada J., Matsumoto S. Nishikawa H. Re-evaluation of waist circumference in metabolic syndrome a comparison between Japanese men and women. Acta Med. Okayama, 2007, vol. 61, no. 3, pp. 167-169.
13. Hedley A.A., Ogden C.L., Jonson C.L. et al. Overweight and obesity among US children, adolescents and adults. 1999-2000. JAMA, 2002, vol. 291. pp. 2847-2850.
14. Oka R., Kobayashi J., Yagi K. et al. Reassessment of the cutoff values of waist circumference and visceral fat for identifying Japanese subjects at risk for the metabolic syndrome. Diabetes Res. Clin. Pract., 2008, vol. 79, pp. 474-481.
15. Seidell C. Obesity in Europe. Obes. Res., 1995, vol. 3 (suppl. 2). pp. 89-93.
16. Bouguerra R., Alberti H., Smida H., et al. Waist circumference cut-off points for identification of abdominal obesity among the Tunisian adult population. Diabetes, Obesity and Metabolism, 2007, vol. 9, no. 6, pp. 859-868.

Table

Prevalence of abdominal obesity using WC cutoff values of ≥102/88 sm. * and ≥94/80 sm. ** in the population of Yakutsk aged ≥60 years (both male and female)

Age groups (years)	Aboriginal			Non-aboriginal			p к-нк	Total population		
	N	n	%	N	n	%		N	n	%
	WC ≥102/88§*									
(I) 60-69	61	23	37.7	89	51	57.3	0.020	150	74	49.3
(II) 70-79	85	29	34.1	82	50	61.0	0.001	167	79	47.3
(III) 80-89	61	16	26.2	56	21	37.5#§	0.193	117	37	31.6 #§
(IV) ≥90	30	10	33.3	21	8	38.1	0.728	51	18	35.3
60 – ≥90	**237**	**78**	**32.9**	**248**	**130**	**52.4**	**0.0001**	**485**	**208**	**42.9**
	WC ≥94/80§§									
(I) 60-69	61	35	57.4	89	69	77.5	0.010	150	104	69.3
(II) 70-79	85	56	65.9	82	65	79.3◊	0.055	167	121	72.5◊
(III) 80-89	61	29	47.5§	56	33	58.9#§	0.220	117	62	53.0#§
(IV) ≥90	30	18	60.0	21	11	52.4#	0.591	51	29	56.9
60 – ≥90	**237**	**138**	**58.2**	**248**	**178**	**71.8**	**0.002**	**485**	**316**	**65.2**
	WC ≥94(90)/80§§§									
(I) 60-69	61	40	65.6	89	69	77.5	0.109	150	109	72.7
(II) 70-79	85	62	72.9	82	65	79.3◊	0.340	167	127	76.0
(III) 80-89	61	36	59.0	56	33	58.9#§	0.992	117	69	59.0
(IV) ≥90	30	19	63.3	21	11	52.4#	0.438	51	30	58.8
60 – ≥90	**237**	**157**	**66.2**	**248**	**178**	**71.8**	**0.189**	**485**	**335**	**69.1**

Notes (title of the table):

* definitions of NCEP ATP III, AACE, and AHA;

** definitions of IDF, ВНОК;

***definitions of JIS.

Notes (values in the table):

 # p<0.05 compared to (I) age group

§ p<0.05 compared to previous age group

◊ p <0.05 compared to (IV) age group

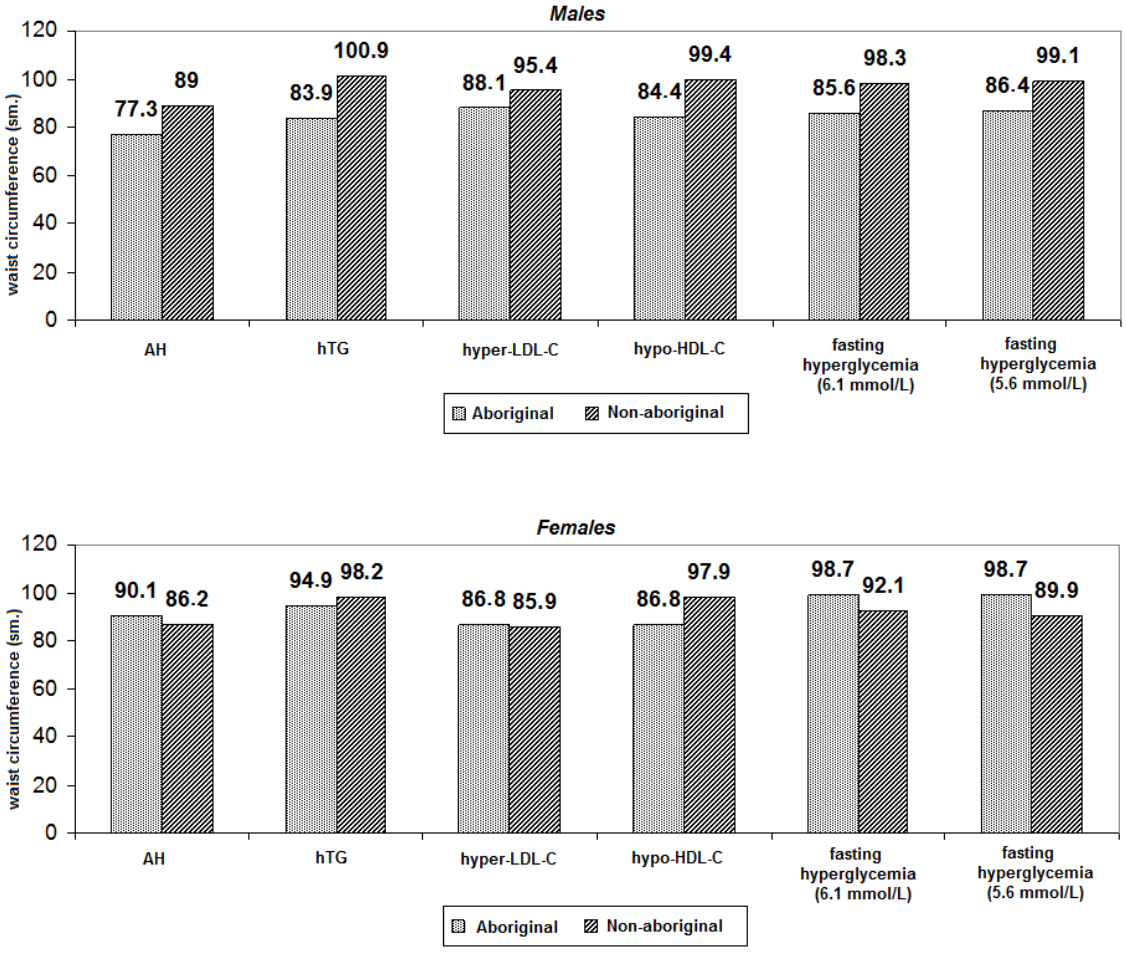

Fig. Waist circumference cutoff values, used for diagnostics in patients with metabolic risk factors, among the population aged ≥60 in Yakutsk.

Author information:

Galina Il'inichna Simonova, Professor, Dr.Med.Sc.(MD), Honored scientist of Russian Federation, Head of Laboratory of Clinical Populational and Preventive Studies in Therapeutic and Endocrine Diseases, Institute of Therapy SB RAMS

Kolymana Konstantinovna Sozonova, endocrinologist, Geriatric Center (Republican Hospital No. 3)

Olga Viktorovna Tatarinova, Cand.Med.Sc. (PhD), Deputy Chief Doctor of the Republican Hospital No.2 (Center for Emergency Medicine), Senior Researcher of the Yakutsk Scientific Center, SB RAMS, Government of the Sakha Republic (Yakutia), Yakutsk

Nikitin YU.P., Professor, Dr.Med.Sc.(MD), Honored scientist of the Russian Federation, RAMS academician, Head of the Laboratory for Internal Diseases, Institute of Therapy SB RAMS