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RESEARCH ARTICLE

Prevalence of Metabolic Syndrome in Adult Population in Afghanistan

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ABSTRACT

Background: After great change in governing of Afghanistan in 2001 the country is experiencing the double burden of communicable and noncommunicable diseases. In this paper, we estimated the prevalence of the Metabolic Syndrome (MetS) and its components among Afghan adults' citizens using data from the first WHO STEP survey.

Methods: This was a cross-sectional study of adults' individuals of ≥ 25 years in five main cities of Afghanistan including Jalalabad, Mazar Sharif, Kandahar, Herat and in Kabul during 2012 to 2015. The study was conducted in accordance with the STEPwise approach of the World Health Organization. Prevalence of metabolic syndrome, its components and associated risk factors were calculated using Adult Treatment Panel (ATP) III criteria modified for Asian in habitants. Data management, analysis and statistical procedures conducted using Epi info v. 7 and SPSS v. 20.

Results: Totally 5897 adult citizens were enrolled in this study. The average age of study subjects 39.56±12.29 years, consisting of 3185 females (54%) and 2712 males (46%). Generally, 62% of participants were illiterate and majority (82.5%) were married. The prevalence of smoking cigarettes and using mouth snuff was 8% and 11.1% and this proportion were very low in females (2.7% and 2.5%) than males (14.1% and 21.1%); this difference was statistically significant (p value=<0.01). The overall prevalence of metabolic syndrome was 39.69% (95%CI: 38.42 – 40.97). The highest rate (52.70%) was recorded in Jalalabad and lowest rate (34.11%) in Herat cities. Moderate physical activity had a statistically significant association with syndrome (OR=1.16; 95%CI:1.031-1.306).

Conclusion: Despite of struggling to control communicable diseases the country is faced with challenge of noncommunicable diseases, if the MetS is counted as a typical model. It warrants formulated public health measures to prevent morbidity and mortality due to noncommunicable disease in the future.

Introduction

Metabolic syndrome (MetS), also called X-syndrome, has been defined as combination and/or clustering clinical and metabolic risk factors including obesity, high triglycerides, high blood pressure, high blood sugar, lower high-density lipoprotein (HDL) (1). However, consensus over definition of this syndrome has been a challenge due to various sets of criteria proposed. Researchers have used various sets of criteria for identification of the MetS in their studies. These are the WHO criteria (2), the Adult Treatment

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Panel III (ATP III) of the National Cholesterol Education Programme (NCEP) in the USA (3) and the International Diabetes Federation (IDF) (4).

The patients with metabolic syndrome are at greater risk of morbidity and mortality following bariatric surgery (5) and it has been associated with cardiovascular disease, diabetes and hypertension as an outcome (6-7). Furthermore, there is association between MetS age, sex as well as (8). MetS is having been contributing to many diseases including cardiovascular diseases, diabetes, dyslipidemia, stroke, osteoarthritis, certain cancers, and death leading to public health concern in most societies (9-11).

In the USA, the prevalence of MetS was 34% (12) while it differs to around 15% in Europe (13). This prevalence ranges from 15 to 20% in Asian countries (14). In Iran, the prevalence of this syndrome is 8% to 35% (15-17). Another systematic review in Iran reported that the pooled prevalence of MetS among the general population of Iran is 26% being higher in females, getting increase by age and more common in urban areas (18).

In India, almost one third and even more population (41%) in urban settings are having metabolic syndrome (19). Furthermore, a study in urban areas of Karachi, Pakistan, showed a prevalence of 34 to 49% by different definitions (20). Moreover, obesity in urban Pakistani population ranged between 46 and 68%, hypertriglyceridemia ranged between 27 and 54%, and in particular, 68 and 81% of the population had low levels of high-density lipoprotein cholesterol (HDL-C) (21). Intervention, focusing on lifestyle demonstrated significant improvements in metabolic syndrome. So, modification and implementation of lifestyle intervention should be considered for people with metabolic syndrome to improve health outcomes avoid chronic diseases (22). In addition, there is higher risk of infection with COVID-19 and development of adverse outcome with patients having metabolic syndrome (23). In Indonesia, it was reported that half of the patients undergoing hemodialysis for end-stage renal failure suffered from MetS (24).

Although, there has been excessive changes and advancement in various aspects of life in Afghanistan since, 2001, however less attention is paid to scientific research and the literature depicts no study regarding burden of metabolic syndrome in Afghanistan. This study aimed to estimate the pattern of metabolic syndrome and its associated factors among urban adult population of five main cities in Afghanistan.

Materials and Methods

A series of cross-sectional risk factors surveys, following the WHO STEPwise approach to surveillance (STEPS) was used to collect, analyze and publish standardized information about noncommunicable diseases and their risk factors in Afghanistan. The methods for these studies have been described in detail in other published studies (25).

The study settings were regional big cities including Jalalabad city (May–June, 2013), Mazar Sharif (April-May, 2015), Herat city (May–June, 2015), Kandahar city (October–November, 2015) and Kabul city (November 2015). Adults' residents aged 25–70 years, including men and women included in the study. Temporary residents (< 6 months), inhabitants of institutionalized settings and insecure areas were excluded. The WHO STEPwise instrument proposes three steps for measuring NCD risk factors including behavioral risk factors, physical measurements and biological risk factors (26). The WHO STEPS tool was adapted for the Afghanistan context.

Taking into account the highest proportion (50%), 95% confidence interval (CI) and margin of error of 5%, a sample size of 385 was calculated. In addition, considering the frequency of risk factors and design effect of cluster sampling totally 1200 subjects were calculated for each city. Practically the team completed and filled 1200 questionnaires in Jalalabad, 1231 in Mazar-e-Sharif, 1129 in Herat, 1165 in Kandahar and 1172 in Kabul. The 2015 Expanded Programme on Immunization (EPI) lists of clusters were obtained from EPI unit in provinces and were used as the sampling

frame for two-stage cluster sampling. In the first stage, random sampling was accomplished using Excel; from the EPI list. Using random numbers in Excel, a group of 4 clusters were selected in Jalalabad, 5 in Mazar-e-Sharif, 16 in Herat, 7 in Kandahar and 5 in Kabul. In the second stage, the overall sample of 1200 households were divided among these selected areas proportionate to the number of households in each cluster/area. Finally, the systematic sampling was used to select households and then randomly one adult member from each household.

The questionnaire used for this survey covered data on demographic including age, sex, level of education, occupation, income and marital status; behavioral factors such as physical activity, consumption of fruits and vegetables, use of cooking oil, use of tobacco; and physical measurements such as blood pressure, weight, height, waist circumference. The venous blood was collected in more than 8 hours fasting status to identify and test for blood lipids and sugar. Local health workers were and trained to collect data. The samples were transported in cold boxes (2–8°C) to Central Public Health Laboratory in Kabul using Cryovials. Data management and analysis were carried out using Epi info v.7 and SPSS, version 20. The research protocol was reviewed by the Institutional Review Board of the Ministry of Public Health and a blanket approval was issued. Informed consent was obtained from each individual before the interview.

In our study we used the criteria for diagnosis of metabolic syndrome recommended by the National Cholesterol Education Program – Adult Treatment Panel III which is defined by the presence of at least three of the following components: waist circumference ≥90 cm in Asian males and ≥80 cm in Asian females; serum triglycerides ≥150 mg/dl (or on treatment for raised triglycerides); HDL cholesterol <40 mg/dL in males and <50 mg/dL in females (or on treatment for reduced HDL-c); blood pressure: systolic ≥130 and/or diastolic ≥85 mmHg (or on treatment for hypertension); and fasting glucose ≥100 mg/dL (or on treatment for increased blood glucose). This criterion was used by another study on metabolic syndrome study in Afghanistan (27-28).

Results

Totally, in this cross-sectional study, five regional urban cities (capital of big provinces) of Afghanistan were surveyed and after excluding subjects with incomplete questionnaires, data for 5897 households were cleaned for analysis in which 17590 adults aged more than 25 years were living. However, one adult from each household were interviewed and on average 3.1 ±1.89 adults were living in each household. Geographically the sample size was almost equally distributed in cities. Principally, 1200 (20.3%) adults from Jalalabad, 1231 (20.9%) from Mazar Sharif, 1129 (19.1%) from Herat, 1165 (19.8%) from Kandahar and 1172 (19.9%) adults from Kabul were included in the final analysis. The average age of study subjects 39.56±12.29 years (standard deviation), consisting of 3185 females (54%) and 2712 males (46%). Generally, 62% of participants were illiterate and majority (82.5%) were married. The prevalence of smoking cigarettes and using mouth snuff was 8% and 11.1% and this proportion were very low in females (2.7% and 2.5%) than males (14.1% and 21.1%); this difference was statistically significant (p value=<0.01). Table 1 reflect the socioeconomic and demographic characteristics of the study subject.

Table 1: Demographic and socioeconomic characteristics of the study participants

Variables	Categories	Female		Males		Total	
		N	%	N	%	N	%
Age Categories							
	25-34	1369	54.196	1157	45.804	2526	43.6
	35-44	895	59.906	599	40.094	1494	25.8
	45-54	534	55.052	436	44.948	970	16.7
	55+	320	39.506	490	60.494	810	14

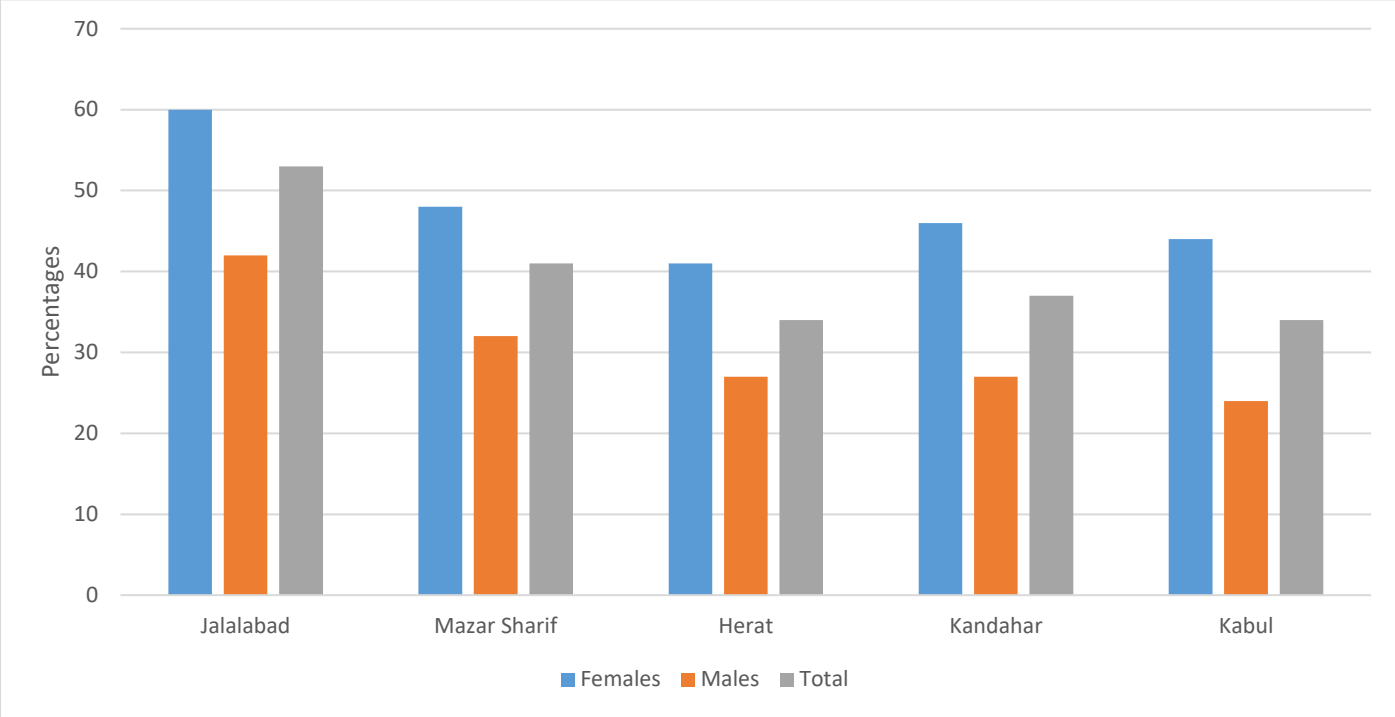
Table 1: *(Continued)*

Variables	Categories	Female		Males		Total	
		N	%	N	%	N	%
Residence							
	Jalalabad	731	60.917	469	39.083	1200	20.349
	Mazar Sharif	664	53.94	567	46.06	1231	20.875
	Herat	594	52.613	535	47.387	1129	19.145
	Kandahar	597	51.245	568	48.755	1165	19.756
	Kabul	599	51.109	573	48.891	1172	19.875
Level of Education							
	Illiterate	2412	66.87	1195	33.13	3607	62.1
	Primary and unofficial	451	38.946	707	61.054	1158	19.9
	Secondary school	178	28.299	451	71.701	629	10.8
	High school and over	109	26.077	309	73.923	418	7.2
Job Categories							
	Official Employees	145	22.9	489	77.129	634	11.6
	Students	27	8.2	304	91.843	331	6
	Private Business	17	2.4	704	97.642	721	13.2
	Worker/Farmer	691	65.4	365	34.564	1056	19.3
	Jobless	895	82.4	191	17.587	1086	19.8
	Housework	996	92.7	78	7.2626	1074	19.6
	Unable/unknown	244	42.5	330	57.491	574	10.5
Monthly Income in AFN							
	Less than 10000	1101	52.3	1003	47.7	2104	75.7
	More than 10000	408	60.4	267	39.6	675	24.3
Marital Status							
	Single	176	33.8	345	66.219	521	9.1
	Married	2925	56.2	2279	43.793	5204	90.9

The dietary habits of study participants revealed that, on average the frequency of fruits and vegetable consumption was 2.76 and 3.85 days per week. Also, 10.5% of study subjects were consuming red meat <2 days per week and 4.6% were consuming chicken >3 days per week. Almost one third of study subjects (27.8%) used table salt with meals. Daily works involving strong physical activity was less common (14.6%) among reported responses while double of that (29.5%) were practicing moderate physical activity. Moreover, half of study subjects (53.4%) had less movement and were reclining more than three hours per day at home.

The overall prevalence of metabolic syndrome for all age groups, irrespective of sex or area of residence, was 39.69% (95%CI: 38.42 – 40.97) using ATP-III criteria mentioned in method section. The highest rate (52.70%) was recorded in Jalalabad and lowest rate (34.11%) in Herat cities. Furthermore, this prevalence was higher in females (48.17%) as compare to males (29.87%). This difference was found geographically in all cities (figure 1).

Figure 1: Bar chart showing the prevalence of MetS with differentiation of sex of participants



The prevalence of each component of metabolic syndrome with differentiation of males and females are given in Table 2.

Table 2: Prevalence of each component of the metabolic syndrome among male and female

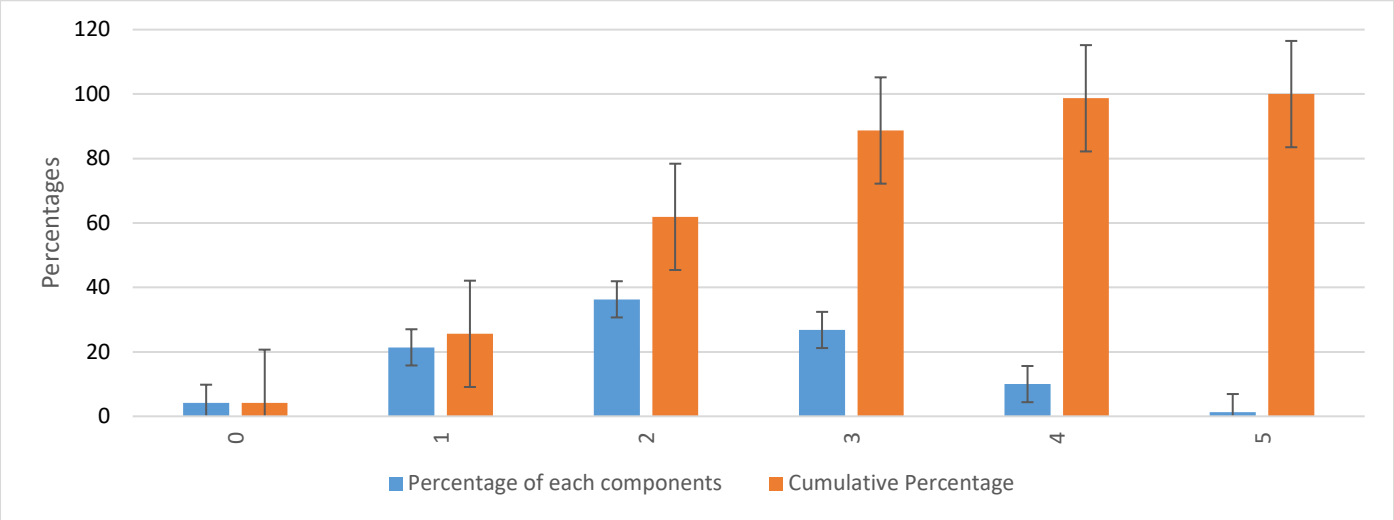
Variables	Categories	Female		Males		Total		OR	CI	
		N	%	N	%	N	%		Lower	Upper
Central Obesity										
	No	681	33.91434	1327	66.08566	2008	35.49585	1		Ref
	Yes	2301	63.05837	1348	36.94163	3649	64.50415	0.301	0.268	0.337
High Blood Pressure										
	No	1787	52.63623	1608	47.36377	3395	67.71041	1		Ref
	Yes	961	59.35763	658	40.64237	1619	32.28959	0.761	0.675	0.858
Raised blood sugar										
	No	2364	53.77616	2032	46.22384	4396	75.00427	1		Ref
	Yes	799	54.53925	666	45.46075	1465	24.99573	0.97	0.861	1.092
Raised triglyceride										
	No	1630	53.56556	1413	46.43444	3043	51.91947	1		Ref
	Yes	1533	54.40028	1285	45.59972	2818	48.08053	0.967	0.872	1.072
Lowered high-density lipoprotein (HDL)										
	No	2138	62.02495	1309	37.97505	3447	58.81249	1		Ref
	Yes	1025	42.46065	1389	57.53935	2414	41.18751	2.213	1.991	2.461

All the components of the metabolic syndrome, were much different among females and males. For instance, central obesity was more prevalent in females 63% (OR=0.13;95%CI:0.27-0.34) than males 37%. High blood pressure was found to be prevalent in 59.35% of females and 40.15% of males and this difference was statistically significant (OR=0.76; 95%CI:0.67 – 0.86). The study could not find any significant association between males and females with respect to fasting blood sugar.

Hypertriglyceridemia was more prevalent among female participants with prevalence rate of 54.40%% compared with 45.59% among males, however it was not statistically significant. Lowered HDL was the common abnormality in both sexes. It was more statistically prevalent among male participants with prevalence rate of 57.53% compared with 42.46% among females (OR=2.21;95%CI: 1.99 – 2.46).

Approximately, 96% of study participants had one or more than one components of metabolic syndrome. The proportion and percentile of each component are given in figure 2. Individually the highest percentage (36.3%) had two components while 1.3% had five components at the same time.

Figure 2: Relative and cumulative percentage of each component of metabolic syndrome



The descriptive characteristics containing central tendencies and tier deviations of measures are described in Table 3. As reported the mean and median of the majority of measures have very less difference, except triglycerides and fasting blood sugar, showing the normal distribution of data obtain from the study.

Table 3. Descriptive characteristics of physical and biochemical measurements used for identification of metabolic syndrome

Variables	Mean	SD	Median	IQR	95% CI
Age (years)	39.56	12.29	37	19	39.24 - 39.88
Height (cm)	162.04	11.65	161	15	161.74 - 162.36
Weight (Kg)	67.65	13.62	67	17	67.3 - 68
Waist Circumference (cm)	90.05	17.36	90	20	89.6 - 90.5
BMI (Kg/m2)	25.93	5.73	25	7	25.78 - 26.08
SBP (mmHg)	124.31	17.69	120	13	123.85 - 124.77
DBP (mmHg)	81.12	12.55	80	15	80.8 - 81.45
FBS (mg/dL)	98.05	65.96	82	27	96.34 - 99.76
Triglycerides (mg/dL)	164.07	89.2	144	71	161.76 - 166.38
Total Cholesterol (mg/dL)	183.78	53.05	177	54	182.38 - 185.16
HDL (mg/dL)	45.19	20.87	41	14	44.65 - 45.74
LDL (mg/dL)	109.45	41.08	103	40	108.38 - 110.51

SD (standard deviation); IQR (interquartile range); CI (Confidence Interval); BMI (body mass index); SBP (systolic blood pressure); DBP (diastolic blood pressure); FBS (fasting blood sugar); HDL (high density lipoprotein); LDL (low density lipoprotein)

The association of prevalence of MetS based on modified APT-III criteria were tested with different demographic and socioeconomic factors as well as dietary habits and physical activities. As mentioned in table 4, there was significant association between age and being classified as metabolic syndrome. Compared to the lowest group, age groups of 35-44 years (OR=1.99; 95%CI: 1.74-2.29), 45-54 years (OR=3.04; 95%CI:2.60-3.55) and more than 55 years (OR=3.46;95%CI:2.92-4.09) had were more likely to have MetS. Similarly, the females had increased odds of MetS compare to males (OR=046; 95%CI:0.41-0.51). Literates of various class as a single category were less likely (OR = 0.72;95%CI064-0.81:) to have Metabolic syndrome compared illiterates. Smokers also had less odds of having MetS compare to nonsmokers (OR=0.61;95%CI:0.49-0.75). The study could not find significant association of taking fruits and having MetS; however, there was a significant association of taking vegetables and being categorized as MetS (OR=1.39;95%CI:1.25-1.55). Type of cooking oil used in kitchen (OR=0.84;95%CI:0.75-0.94) and frequency of taking meal outside home (OR=0.76;95%CI:0.60-0.95) were significantly associated with MetS among study participants. Strong physical activity which is defined in STEP surveys are not found to have association with MetS in this study; however moderate physical activity had a statistically significant association with syndrome (OR=1.16; 95%CI:1.031-1.306).

Table 4: Univariate analysis of metabolic syndrome and its associated demographic, socioeconomic, diet and physical activities among study subjects

Variables	Categories	MetS Absent		MetS Present		Total		Odds Ratio	CI 95%	
		N	%	N	%	N	%		Upper	Lower
Age in years										
	25 - 34	1753	72.708	658	27.29	2411	43.31	1		Ref
	35 - 44	822	57.203	615	42.8	1437	25.81	1.993	1.737	2.287
	45 - 54	439	46.702	501	53.3	940	16.89	3.04	2.6	3.555
	55 and over	339	43.517	440	56.48	779	13.99	3.458	2.924	4.089
Sex										
	Female	1571	51.831	1460	48.17	3031	53.63	1		Ref
	Male	1838	70.126	783	29.87	2621	46.37	0.458	0.411	0.512
Level of education										
	Illiterate	1962	56.853	1489	43.15	3451	66.09	1	Ref	
	Literate	1144	64.596	627	35.4	1771	33.91	0.722	0.642	0.813
Smoking										
	No	3067	59.623	2077	40.38	5144	91.97	1		Ref
	Yes	318	70.824	131	29.18	449	8.028	0.608	0.493	0.751
Fruits serving days per week										
	< 3 days	2380	61.01	1521	38.99	3901	71.88	1	Ref	
	≥ 3 days	902	59.109	624	40.89	1526	28.12	1.082	0.959	1.221
Vegetables serving days per week										
	< 3 days	1778	64.42	982	35.58	2760	49.61	1		Ref
	≥ 3 days	1583	56.475	1220	43.52	2803	50.39	1.395	1.253	1.554
Type of kitchen oil										
	Solid	1375	58.386	980	41.61	2355	50.16	1		Ref
	Liquid	1463	62.521	877	37.48	2340	49.84	0.841	0.748	0.946
Eating meal outside home										
	≤ 3 times	2280	61.94	1401	38.06	3681	90.89	1		Ref
	> 3 times	252	68.293	117	31.71	369	9.111	0.756	0.601	0.95

Table 4 *(Continued)*

Variables	Categories	MetS Absent		MetS Present		Total		Odds Ratio	CI 95%	
		N	%	N	%	N	%		Upper	Lower
Strong Physical Activity										
	No	2896	60.649	1879	39.35	4775	85.63	1		Ref
	Yes	476	59.426	325	40.57	801	14.37	1.052	0.903	1.226
Moderate Physical Activity										
	No	2385	61.517	1492	38.48	3877	70.63	1		Ref
	Yes	934	57.94	678	42.06	1612	29.37	1.16	1.031	1.306

Discussion

Afghanistan is a low-income country suffering from double burden of diseases including communicable and noncommunicable diseases. Lack of evidence, particularly in health sector, has challenged the informed decision making in Afghanistan. We performed this analysis to fill the gap of knowledge and report the pattern of metabolic syndrome in the country. So, in the current study, the overall burden of MetS estimates in adult population in five big cities were reported to be approximately 40%. In addition, the components of metabolic syndrome including high blood pressure (29-30), diabetes mellitus (31), hypercholesterolaemia (32) obesity (33-34) and low level of low HDL rates have been reported earlier to be high. It should be noted that the study was conducted in urban settings in which the prevalence is mostly higher as compare to rural areas (35-36). The finding on prevalence of this syndrome is consistent with Arab countries such as Saudi Arabia (37), Jordan (38-39) and Kuwait (40). However, some reports in south Asia (41) and gulf countries (42-44) shows lower prevalence that what study found. Such disagreement in the prevalence of MetS across different countries could be a consequence of genetic makeup, environment, demographic and epidemiological transitions as well as modification of definitions and change in method of studies. The prevalence of metabolic syndrome in this study was increasing by age which is consistent with other studies (37, 39). Such findings are justified due to changes in hormonal balance, obesity and insulin resistance which is reported elsewhere (45). Females had higher prevalence of MetS as compare to males in this study which is both consistent (46-48) and contradictory with other studies published (37, 49-50). This significant difference may be due to low mobility and being bound at homes in women in Afghanistan. Study found a significant association between syndrome and education level which is supported by other studies (37,51-52). The relationship could be mediated by other risk factors including awareness, having health literacy and well dietary habits. In the current study, we couldn't find significant effect of a level of income on metabolic syndrome. Although consistent results were found in Saudi Arabia (37) but the finding is unexpected because such association was found in other studies reported in literature (53-54). Furthermore, dietary habits including taking fruits, meat and chicken were not associated with metabolic syndrome while such significant association was found for taking vegetables, type of kitchen oil and frequency of taking meal outside home. A study conducted in Syria found significant of association between carbonated beverages, grains, chicken, and meat and the presence of the metabolic syndrome (55). Approximately 96% of the adult's population had at least one or more component of the syndrome. In studies conducted in Iran showed that 88-92% of adults had at least one of the components of the metabolic syndrome (36, 56).

Provision of information on metabolic syndrome in a country having no published reports on the syndrome could be counted its key strength. Furthermore, it has used the known definition with criteria and using blood tests in laboratory or blood sugar and lipids with sufficient sample size. However, it is not a nationwide study and does not contain the rural areas, therefore the findings are hardly generalizable all over the country. In addition, cross sectional studies collect data on outcome and risk factor at the same time and, thus, the causal relationship could not be elicited.

The prevalence of MetS in Afghanistan is considered to be high and the findings indicate that metabolic syndrome is increasing and would be a serious public health problem soon. The syndrome was associated with sex, age, education, physical activity and dietary habits. This high prevalence could be due to epidemiological and demographic transitions happening after decreasing infectious diseases in the country. Lack of exercise, lifestyle changes and unhealthy dietary habits. These findings provide evidence to alert policy makers in the country to formulate interventions to stop and prevent the prevalence of each component of the syndrome. So, suitable and tailored dietary habits, practical physical activities and motivating of healthy lifestyles are encouraged. National and updated studies are recommended to explore the causal relationship of risk factors, components and metabolic syndrome itself in the country.

Data availability

The dataset used for this study will be available from corresponding author based on reasonable request.

Authors' contribution

All of the author contributed equally.

Conflict of interest

The authors declare no conflict of interest.

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