ORIGINAL ARTICLE

PREVALENCE AND DETERMINANTS ASSOCIATED WITH METABOLIC SYNDROME AMONG ADULTS IN DISTRICT KHAIRPUR MIRS SINDH

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Background: Metabolic Syndrome (MetS) is precursor and diagnostic criteria for Diabetics and Cardiovascular Diseases (CVD). This study investigated the prevalence of MetS and its risk factors among adults of District Khairpur Sindh. **Methods:** A cross-sectional study was carried out using IDF and NCEP-ATP-III criteria. The demographic and lifestyle data was obtained from participants by detailed interview using Global Physical Activity Questionnaire following WHO guidelines. Besides standard anthropometric measurements and blood pressure, fasting blood glucose and lipid profile were analysed in the Research and Diagnostic Laboratory of Microbiology Department, Shah Abdul Latif University, Khairpur. Data was processed on SPSS-22, and presented as Mean±SD and percentages. Unpaired *t*-test was applied and Odds ratio was calculated, and $p \leq 0.05$ was taken as significant. **Results:** A total of 394 healthy adults were randomly contacted; handicapped and non-willing subjects were excluded. Among them, 202 adults, 109 (54%) male and 93 (46%) female agreed to participate. Mean age of subjects was 33.38±12.61 years (male 34.39±12.96, and females 32.19±12.14). The overall prevalence of MetS was 35.6% and 24.3% in males and females respectively. The age group 41−50 was at the highest risk of MetS according to reference values of NCEP-ATP-III (OR: 17.56, $p<0.0001$) and IDF (OR: 12.53, $p<0.0001$). BMI and LDL were significantly ($p<0.05$) higher in female, whereas WHR was significantly higher in male ($p<0.05$). All other components were statistically non-significant. **Conclusion:** The prevalence of MetS was found higher using IDF criteria. It increases with age. Women show higher prevalence of MetS than men in older age group.

Keywords: MetS, Hypertension, WHR, HDL, IDF, NCEP-ATP-III, Waist circumference, BMI, LDL

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INTRODUCTION

Metabolic Syndrome (MetS) has become a main health challenge worldwide. Prevalence of MetS is quickly rising in developing countries due to changing lifestyle. A worldwide alteration in the disease pattern has been observed where the relative impact of infectious diseases are decreasing while chronic disease like diabetes and cardiovascular disease (CVD) are increasingly dominating the disease pattern.[1] For the last 15 years, Indian epidemiologists and the World Health Organization (WHO) have been giving information for quickly rising burden and consequences of CVD. CVD will be the largest cause of disability and death in Asian countries, with 2.6 million Asian predicted to die due to CVD by 2020–2025.[2] It is also associated with a group of risk factors like central obesity, insulin resistant, hypertension, dysglycaemia and dyslipidemia.[3] These risk factors tend to cluster together and increase the risk of cardiovascular disease the risk of cardiovascular diseases (CVD. Several criteria and definitions have been used to identity Metabolic Syndrome.[2,4] It is generally believed that a combination of three or more of five following components must be present in MetS: large waist circumference, elevated triglycerides, low HDL-cholesterol, raised blood pressure and elevated fasting blood glucose.[1,2,5] According to IDF some 25% of the world population has MetS, although this approximation diverges extensively due to the reason of age, ethnicity, and gender of population studies.[6,7] The prevalence of MetS is increasing internationally and is related with amplified risks of developing diabetes mellitus, atherosclerosis, and myocardial infraction.[8] In 2001 the NCEP-ATP-III provided a working definition of MetS which was based on five commonly measure clinical criteria that clinician could implement in their clinical practices.[6,9,10] It was assessed that the unadjusted prevalence of MetS between US adults was observed as 21.7% during the years 1988 to 1994.[10,11]

The objectives of this study were to see prevalence of MetS and related determinants of MetS, and to examine the concordance of the two definitions among adults of District Khairpur, Pakistan, using new IDF and NCEP-ATP-III definitions.

MATERIAL AND METHODS

It was a cross-sectional study carried out in 2017−2018 to collect epidemiological data on MetS in District Khairpur Mirs Sindh after approval from University of Sindh, Jamshoro. The Participants were randomly selected. After informed consent, all healthy adult willing to participate were selected. All those on any

medication or with history of any illness or medical condition, including cancer, eating disorders, digestive disorders, asthma, chronic allergies, and handicapped subjects were excluded. Selected adult participants were interviewed and asked about their sociodemographic characteristics, household kitchen items, personal and family medical history through interview-based questionnaire following WHO guidelines. Anthropometric measurements and blood samples was collected. The socio-demographic, economic status and physical activity of the participants was considered using standard methods. Height (Cm), weight (Kg), and waist circumference (Cm) were measured and mean of 3 readings was determined. Sitting blood pressure was measured using mercury sphygmomanometer.

Biochemical analysis was performed in Microbiology Department of Shah Abdul Latif University Khairpur. Blood for biochemical analysis was obtained from the participants after 10–12 hours of overnight fasting. Blood glucose was measured using Glucometer AccuCheck Active™. Serum was immediately separated and stored at -80 ℃ till analysis. Samples were analyzed using MicroLab 300™. Total Cholesterol (TC), Triglycerides (TG), Low-Density Lipoproteins (LDL), and High-Density Lipoproteins (HDL) were measured. MetS was defined according to ATP-III and IDF criteria for Asians (Table-1). Data was analyzed using SPSS-22 for qualitative and quantitative variables. Data were presented as Mean±SD and percentages. Unpaired *t*-test was applied and Odds ratio was calculated, and $p \leq 0.05$ was taken as significant.

Table-1: Definitions for diagnosing MetS

Clinical measurements	NCEP-ATP- III (Any 3, from below 5)	IDF(2005) (WC any 2 from below)
Body weight	WC≥102 Cm in men or ≥88 Cm in women	South Asians ≥90 Cm in men ≥80 Cm in Women
Triglycerides	TG≥150 mg/dl	TG≥150 mg/dl
High Density Lipoprotein cholesterol	HDL-C <40 mg/dl in men or <50 mg/dl in women	HDL-C <40 mg/dl in men or <50 mg/dl in women
Blood Pressure	≥135/85 mmHg	≥135/85 mmHg
Glucose	>110 mg/dl includes diabetes	≥100 mg/dl includes diabetes

RESULTS

Mean age of the subjects was 33.38±12.61 years. Mean age of males was 34.39±12.96 years and that of the females was 32.19±12.14 years. Prevalence of MetS was 35.6% and 24.3% according to IDF and NCEP-ATP-III respectively. The overall gender-wise prevalence of MetS according to IDF, NCEP-ATP-III criteria with percentage of sample population is given in Table-2.

The Mean and SD of all variables were compared, BMI and LDL values were definitely ($p<0.05$) upper in female subjects, whereas WHR was significantly higher in male subjects ($p<0.05$) and other components were statistically non-significant (Table-3).

Age group 41–50 years was at the highest risk according to NCEP-ATP-III (OR 6.175, $p<0.0001$), and IDF (OR 12.53, $p<0.0001$) (Table-4). Number of MetS components (BMI, TG, HDL, IFG, SBP, HDL, LDL) was found highest in female subjects following both criteria (Table-5, 6).

Table-2: The gender-wise prevalence of MetS according to IDF and NCEP-ATP-III criteria [n (%)]

Gender	ATP-III n (%)	IDF n (%)	Total
Male	15 (30.6)	30 (41.7)	109
Female	34 (69.4)	42 (58.3)	93
Total	49 (24.3)	72 (35.64)	202

Table-3: Anthropometric and laboratory investigations of sample population (Mean±SD)

Variables	Mean±SD Male	Mean±SD Female	*p*
Age (Years)	34.39±12.966	32.19±12.145	0.2172
BMI (Kg/m^2)	23.83±4.04	25.43±5.361	0.017*
Waist-hip ratio	0.879±0.527	0.847±.0696	0.000*
Waist circumference (Cm)	34.62±3.75	33.99±4.99	0.310*
Systolic BP (mmHg)	123.35±11.49	122.42±13.05	0.591
Diastolic BP (mmHg)	81.93±10.86	80.75±11.54	1.174
Fasting Plasma Glucose (mg/dl)	94.25±26.86	90.53±21.30	2.83
Cholesterol (mg/dl)	161.53±42.17	167.59±34.47	2.86
Triglycerides (mg/dl)	142±52.03	138±39.92	5.63
LDL (mg/dl)	88.88±25.794	99.08±31.57	0.012*
HDL (mg/dl)	45.61±7.112	44.371±6.455	0.199

*Significant

Table-4: Prevalence of MetS according to age group using IDF and NCEP-ATP-III criteria

Age (Years)	IDF Non-MetS	IDF MetS	IDF Total	IDF Odd Ratio	IDF *p*	NCEP-ATP-III Non-MetS	NCEP-ATP-III MetS	NCEP-ATP-III Total	NCEP-ATP-III Odd Ratio	NCEP-ATP-III *p*
18–30	85	13	98	Ref -1		93	5	98	Ref -1	
31–40	21	21	42	6.53	<0.0001	26	16	42	4.02	<0.001
41–50	12	23	35	12.53	<0.0001	18	17	35	6.175	<0.0001
51–70	12	15	27	8.1	<0.0001	16	11	27	4.495	<0.001

Table-5: MetS components found positive in subjects according IDF criteria [n (%)]

MetS components positive	Females (n=93)	Males (n=109)
0	3 (3.22)	25 (22.90)
1	19 (20.4)	32 (29.4)
2	27 (29.0)	16 (14.67)
3	21 (22.6)	18 (16.5)
≥4	23 (24.73)	10 (9.17)

Table-6: MetS components found positive in subjects according NCEP-ATP-III criteria [n (%)]

MetS components positive	Females (n=93)	Males (n=109)
0	6 (6.5)	32 (29.4)
1	26 (28.5)	41 (37.6)
2	27 (29.0)	21 (19.3)
3	16 (17.2)	12 (11.0)
≥4	18 (19.35)	4 (3.6)

DISCUSSION

The prevalence of MetS was found to be 35.6% and 24.3% in males and females respectively using IDF and NCEP-ATP-III criteria among our sample population. Results of various studies revealed that the WC, BMI, changing lifestyle, and urbanization, moved the graph upward in Pakistan.[12] The MetS is well known to enhance the risk of CVDs, stroke, and type 2 diabetes, it is much predominant in Pakistan like elsewhere in the world.[12,13] However in this study WC, and BMI was significantly high, this is not surprising as it has been evident that central obesity precedes the appearance of other MetS components. In Asian population central obesity is found more common.[13] The National Health Survey revealed that 25% of Pakistani population is obese. It was shown that the prevalence of MetS is 34.8% and 25.3% in Pakistan and India respectively.[13,14]

MetS and related components are common in rural and urban population of Pakistan. The incidence of MetS in Pakistan ranges from 18 to 46%.[12–16] We validated high prevalence of obesity and overweight in rural areas. Similar surveys were carried out either on the basis of hospital samples or on specific district areas.[15] The differences in prevalence of MetS components were due to variability in the cut-off values used in different definitions and bigger sample size of those studies[17]. MetS is the main contributing factor for other diseases like fatty liver disease, and is frequently observed in overweight and obese population.[18] The majority of females in South Asian countries are housewives, whereas males are busy in other daily activities.[19] Our study has demonstrated that prevalence of MetS was 41.7% in males and 58.3% in females. The present study is quite similar with those from other South Asian countries.[12,16–20] However the results of our study are higher than the studies from Japan, Taiwan, China, and Singapore.[20,21] It was also reported that in most advanced western countries the frequencies of MetS are much more higher than under developed countries of South Asia.[14,22] On the other hand, it was reported that the MetS has been observed twice in South Asian refugees in Unites State of America. Implementation of western type lifestyle and movement has led to the amplified prevalence of MetS in immigrants from South Asian regions.[20,23–25]

The current study followed the criteria of IDF and NCEP-ATP-III for elaboration of MetS. Most of other studies also followed IDF and NCEP-ATP-III criteria. They indicated low MetS and high prevalence of diabetes mellitus in their populations.[8,10,26–28] Using NCEP-ATP-III criteria for central obesity to WC is more useful to identify the MetS in Asia.[29] Obesity and physical inactivity are two primary risk factors for development of hypertension, insulin resistance, and dyslipidemia.[16,30]

CONCLUSION

The prevalence of MetS was found higher using IDF criteria. It increases with age. Women show higher prevalence of MetS than men in older age group.

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