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ORIGINAL ARTICLE

Prevalence of Metabolic Syndrome and Their Associated Risk Factors Amongst Adults in District Bahawalpur

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ABSTRACT

Background: Globally metabolic syndrome is considered as important public health issue because of its association with the higher possibility to develop diabetes and heart problems in children, teenagers, and adults.
Objective: To assess the prevalence of metabolic syndrome and their associated risk factors amongst adults.
Methodology: This was cross-sectional study piloted at the physiology department Bahawalpur Victoria Hospital, Bahawalpur for duration of one year from January 2018 to January 2019. All the information including socio-demographic and anthropometric information were recorded on a predesigned Performa. Blood samples were taken and sent to hospital laboratory for blood chemistry analysis. All of the data was analyzed by using the SPSS version 23 software.
Results: In this study a total of 750 participants were included. The overall prevalence of metabolic syndrome was observed in 260 (34.67%) participants. In our study, 156 (60%) female participants and 104 (40%) male were observed with metabolic syndrome. Obese participants having OR of 15.77, age ≥51 years with OR 6.11 and overweight participants with OR of 6.55 were at high risk to develop metabolic syndrome in our study. Based on our study findings, the most common and important factors that affect participants were hyperglycemia (OR: 4.84), high blood pressure (OR: 4.31), abdominal obesity (OR: 350.55), high-TG (OR: 5.81) and low-HDL (OR: 10.3).
Conclusion: Our study concludes that metabolic syndrome is high prevalent in our population with female predominance.
Keywords: Prevalence; Metabolic syndrome; Risk factors; Adults

INTRODUCTION

Globally metabolic syndrome is considered as important public health issue because of its association with the higher possibility to develop diabetes and heart problems in children, teenagers, and adults.[1] Numerous risk factors are considered to confirm the diagnosis of metabolic syndrome.[2] Due to combination of the risk variables, a person with abdominal obesity, raised blood pressure, and a higher fasting plasma glucose has a higher risk for cardiovascular disease.[3,4] According to the findings of a prospective cohort research including 6255 individuals, those who had one or more metabolic syndrome risk variables were at higher risk for cardiovascular diseases. In addition, when compared to its separate components, metabolic syndrome significantly indicates CVD, CHD and overall death rate. [4] National Health and Nutrition Examination Survey (NHANES III) data shows that metabolic syndrome is more prevalent among children and adolescents, especially those who are overweight or obese.[5] According to the International Obesity Task Force (IOTF), globally, about 10% of school-aged children (aged 5–17 years) are obese or overweight, accounting for 155 million children.[6] The mean metabolic syndrome prevalence in children was 3.3 percent (0–19.2 percent) in a comprehensive review of 463 investigations documenting the epidemiological study of metabolic syndrome in children, with 11.9 percent (2.8–29.3 percent) in overweight populations and 29.2 percent (10.0–66.0 percent) in obese communities. [7] In the early 21st century, metabolic syndrome is already one of the most significant complicated diseases, and some researchers believe it to be a worldwide epidemic. [8,9] Metabolic syndrome affects one-third of North Americans and approximately 20% of Europe's adult population. [10, 11] Metabolic syndrome is estimated to affect about 24.9 percent of the population in Latin America. [12] A large study in Brazil found that the prevalence of metabolic syndrome in the adult population is comparable to that in industrialized nations, with an average estimate of 29.6%. [13] Additionally, there is also significant dispute about the actual presence of metabolic syndrome. [14, 15] Regardless of the form or reality of the condition, all of its constituent disorders have been proven to raise the risk of heart disease and diabetes separately and frequently. [16] Pakistani lifestyles and eating habits have evolved throughout the decades in parallel with worldwide political, social and economic shifts. The widespread marketing and accessibility of fast meals and fizzy beverages has a particularly negative impact on children. A similar meta-change has taken place in Bahawalpur as well, and as doctors, it has become more important to strike a balance between the individual and public health elements of treatment. This research work was therefore piloted to assess the metabolic syndrome prevalence and their associated risk factors amongst adults in district Bahawalpur.

Operational definition:

Hypertension: High blood pressure was defined as a blood pressure of 140 mmHg or 90 mmHg at the time of enrollment, or previous treatment with antihypertensive drugs, regardless of their BP measurement.
Diabetes mellitus: It was defined as fasting blood sugar ≥100 mg/ dl (5.6 mmol/l) or drug treatment for diabetes mellitus.
Hyperlipidemia: It is defined as high level of lipids in the blood. Hypertriglyceredimia is ≥150 mg/dl (1.7 mmol/l), low HDL (Males <40 mg/dl (1 mmol/l) and for females <50 mg/dl (1.3 mmol/l.
Waist circumference: It is defined as measurement taken around the abdomen at the level of the belly button.
Metabolic syndrome: It was defined as the presence of any three of the following condition
1 Increased waist circumference (males: ≥90 cm and for females: ≥80 cm)
2 Hypertriglyceredimia ≥150 mg/dl (1.7 mmol/l),
3 Low HDL (Males <40 mg/dl (1 mmol/l) and for females <50 mg/dl (1.3 mmol/l),
4 Elevated blood pressure (systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg or drug treatment for hypertension), and
5 Elevated blood sugar (fasting blood sugar ≥100 mg/ dl (5.6 mmol/l) or drug treatment for diabetes mellitus.

MATERIALS AND METHODS

This was cross-sectional study piloted at the physiology department of Bahawalpur Victoria Hospital, Bahawalpur. The study duration was one year from January 2018 to January 2019. Approval to this study was given by the hospital research and ethical committee before sampling. Informed consent was signed in written from all the participants. The inclusion criteria for our study was all the individuals of both the gender having age greater than 18 and willing to participate in our study while the exclusion criteria was all the patients with HIV, hepatitis B and c, eating problems, allergy and cancer. Pregnant women were also excluded. All the information including socio-demographic and anthropometric information were recorded on a predesigned Performa. Physical activity was divided into four categories: low (walking ≤ one hour per day), moderate (walking ≥ one hour per day), high (vigorous exercise for ≤half hour minutes per day), and very high (vigorous exercise for ≥ half hour per day). Anthropometric measures, such as weight and height, were taken by trained personnel. A standardized sphygmomanometer was used to measure blood pressure. Blood samples were collected from all the individuals and were transported to the hospital diagnostic laboratory for blood biochemistry analysis. All of the data was analyzed by using the SPSS version 23 software. Mean and standard deviation were documented for continuous variables, while categorical variables were calculated as percentages and proportions. A chi-square test was used for categorical variables. Logistic regression was used to determine the association between the metabolic syndrome and risk factors. <0.05 p value considered as significant statistically. All the data was presented in figure and tabulated form.

RESULTS

In this study a total of 750 participants were included. There were 430 (57.33%) male and 320 (42.67%) female in our study. The mean (SD) age was 41.23 (11.4) years with minimum age of 18 and maximum age of 70 years. According to the age wise distribution, 352 (46.93%) participants were in the age group 18-30, 176 (23.47%) participants in the age group 31-40, 150 (20%) participants in the age group 41-50 and 72 (9.6%) participants in the age group ≥51 years. According to the level of education, 125 (16.67%) participants were uneducated, 175 (23.33%) were primary, 300 (40%) were secondary and 150 (20%) were university level educated. According to smoking status, current smoker were 23 (3.06%), 52 (6.93%) were former smoker and 675 (90%) never smoke. The average (SD) BMI in our study was 28.22 (7.90)kg/m^2. According to obesity, 35 (4.67%) participants were underweight, 250 (33.33%) were normal weight, 225 (30%) were overweight and 240 (32%) participants were obese. According to physical activity, 525 (70%) participants were Low, 170 (22.67%) were moderate, 40 (5.33%) were high and 15 (2%) participants were very high. The mean (SD) waist circumference was 80 (12.13) cm. Abdominal obesity was observed in 300 (40%) participants. Diabetes was observed in 60 (8%) participants, hypertension was observed in 300 (40%) participants in our study. (Table 1) The mean systolic and diastolic blood pressure was 122 (9.14) and 80 (6.26) mmHg respectively. The mean (SD) glysemia, cholesterol, HDL, LDL and triglycerides were 110 (9.09), 160 (45.21), 33.21 (9.26), 83 (25.23) and 170 (35.14) mg/dl respectively. (Table 2) The overall prevalence of metabolic syndrome was observed in 260 (34.67%) participants. (Figure 1) In our study, 156 (60%) female participants and 104 (40%) male were observed with metabolic syndrome. The mean (SD) age in participants with metabolic syndrome was 46.14 (11.33) years (p=0.002).

Metabolic syndrome prevalence on the basis of education for uneducated, primary, secondary and university level education was 7 (2.69%), 98 (37.69%), 140 (53.85%) and 15 (5.77%) respectively (p=0.001). Metabolic syndrome prevalence on the basis of smoking status for current smoker, former smoker and never smoker was 5 (1.92%), 20 (7.69%) and 235 (90.38%) respectively (p=0.07). The average (SD) BMI in participants with Metabolic syndrome was 30.32 (6.44) kg/m^2 (p=0.002). Metabolic syndrome prevalence on the basis of obesity with normal weight, overweight and obese was 20 (7.69%), 91 (35%) and 149 (57.31) respectively while no underweight, participant was observed with metabolic syndrome in our study (p=0.001). Metabolic syndrome prevalence on the basis of physical activity with low, moderate, high and very high physical activity was 195 (75%), 52 (20%), 10 (3.85%) and 3(1.15%) respectively (p=0.003). The mean (SD) waist circumference was 93 (19.33) cm in participants with Metabolic syndrome (p=0.001). Metabolic syndrome was observed in 95% of the participants with abdominal obesity (p=0.001). Among participants with diabetes and hypertension, Metabolic syndrome was observed in 43.33% and 56% participants respectively (p=0.004). (Table 3) Amongst participants with Metabolic syndrome the mean (SD) systolic and diastolic

blood pressure was 130 (8.27) and 85 (9.33) mmHg respectively (p<0.005) while amongst participants with Metabolic syndrome, the mean (SD) glysemia, cholesterol, HDL, LDL and triglycerides were 110 (9.09), 175 (55.33), 32.41 (8.21), 115 (45.33) and 180 (31.56) mg/dl respectively (p<0.05). (Table 4)

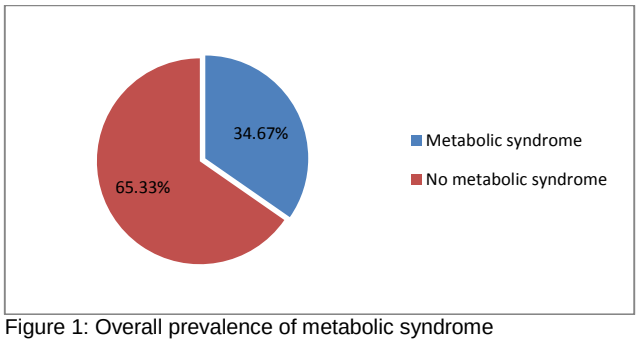

Figure 1: Overall prevalence of metabolic syndrome

Table 1: Socio-demographic feature of the participants

Parameter	Category	Frequency	Percentage
Gender	Male	430	57.33%
	Female	320	42.67%
Age	18-30	352	46.93%
	31-40	176	23.47%
	41-50	150	20%
	≥51	72	9.6%
Education	Uneducated	125	16.67%
	Primary	175	23.33%
	Secondary	300	40%
	University level	150	20%
Obesity	Underweight	35	4.67%
	Normal weight	250	33.33%
	overweight	225	30%
	Obese	240	32%
Physical activity	Low	525	70%
	Moderate	170	22.67%
	High	40	5.33%
	Very high	15	2%
Smoking	Current smoker	23	3.06%
	Former smoker	52	6.93%
	Never smoke	675	90%
Abdominal obesity	Yes	300	40%
	NO	450	60%
Diabetes	Yes	60	8%
	NO	690	92%
Hypertension	Yes	300	40%
	NO	450	60%

Table 2: Anthropometric and laboratory parameters of the participants

Parameter	Mean (SD)
Waist circumference	80 (12.13)cm.
BMI	28.22 (7.90) kg/m^2
Systolic blood pressure	122 (9.14) mmHg
Diastolic blood pressure	80 (6.26) mmHg
Glysemia	110 (9.09) mg/dl
Cholesterol	160 (45.21) mg/dl
HDL	33.21 (9.26) mg/dl
LDL	83 (25.23) mg/dl
Triglycerides	170 (35.14) mg/dl

Obese participants having OR of 15.77, age ≥51 years with OR 6.11 and overweight participants with OR of 6.55 were at high risk to develop metabolic syndrome in our study. (Table 5) Based on our study findings, the most common and important factors that affect participants were hyperglycemia (OR: 4.84), high blood pressure (OR: 4.31), abdominal obesity (OR: 350.55), high-TG (OR: 5.81) and low-HDL (OR: 10.3). (Table 6)

Table 3: Prevalence of metabolic syndrome associated with different factors

Parameter	Category	Individuals with Metabolic syndrome N (%)	P value
Gender	Male	104 (40%)	0.001
	Female	156 (60%)	
Age	Mean (SD)	46.14 (11.33)	0.002
Education	Uneducated	7 (2.69%),	0.001
	Primary	98 (37.69%),	
	Secondary	140 (53.85%)	
	University level	15 (5.77%)	
Obesity	Underweight	000	0.001
	Normal weight	20 (7.69%),	
	overweight	91 (35%)	
	Obese	149 (57.31)	
Physical activity	Low	195 (75%)	0.003
	Moderate	52 (20%)	
	High	10 (3.85%)	
	Very high	3(1.15%)	
Smoking	Current smoker	5 (1.92%)	0.07
	Former smoker	20 (7.69%)	
	Never smoke	235 (90.38%)	
Abdominal obesity	Yes	285 (95%)	0.001
	NO	18 (4%)	
Diabetes	Yes	26 (43.33%)	0.004
	NO	207 (30%)	
Hypertension	Yes	168 (56%)	0.001
	NO	18 (4%)	

Table 4: Mean anthropometric and laboratory measure in patients with metabolic syndrome

Parameter	Individuals with Metabolic syndrome Mean (SD)	P value
Waist circumference	93 (19.33)cm	0.001
BMI	30.32(6.44)kg/m^2	0.002
Systolic blood pressure	130 (8.27) mmHg	0.001
Diastolic blood pressure	85 (9.33)mmHg	0.001
Glysemia	110 (9.09) mg/dl	0.001
Cholesterol	175 (55.33) mg/dl	0.001
HDL	32.41 (8.21) mg/dl	0.001
LDL	115 (45.33) mg/dl	0.001
Triglycerides	180 (31.56) mg/dl	0.001

Table 5: Association of metabolic syndrome with socio-demographic factors

Parameter	Category	Odds ration	95% CI	P value
Age	18-30	3.20	1.90-6.80	0.004
	31-40	4.19	2.11-7.96	0.009
	41-50	4.59	3.59-8.12	0.001
	≥51	6.11	3.77-11.01	0.006
Education	Uneducated	0.43	0.14-2.11	0.07
	Primary level	0.63	0.16-2.0	0.09
	Secondary	0.72	0.17-2.23	0.13

	level			
	University level	0.11	0.04-0.76	0.001
Obesity	Underweight	000	00-00	0.92
	Normal weight	000	00-00	0.92
	overweight	6.55	4.88-14.05	0.009
	Obese	15.77	8.31-26.86	0.001
Physical activity	Low activity	0.61	0.38-1.0	0.04
	Moderate activity	0.69	0.35-0.98	0.001
	High activity	0.25	0.14-0.80	0.41
	Very high activity	0.41	0.11-0.77	0.07
Smoking	Current smoker	2.99	0.1-8.95	0.08
	Former smoker	2.11	0.64-7.77	0.09
	Never smoke	2.08	0.1-8.95	0.09
Abdominal obesity		350.55	131.11-950.21	0.001

Table 6: Association of metabolic syndrome with anthropometric and laboratory measure

Parameter	OR	95% CI	P value
Blood pressure (High)	4.31	2.19-8.45	0.009
Hyper-glycemia	4.84	2.25-8.87	0.006
High cholesterol	2.25	1.12-5.01	0.03
HDL	10.31	4.11-23.61	0.009
High triglycerides	5.81	2.73-12.05	0.007

DISCUSSION

In this research, the prevalence of metabolic syndrome and the risk factors associated with it were investigated in the Bahawalpur area.

The overall metabolic syndrome prevalence was observed in 260 (34.67%) participants. According to the previous studies, in Pakistan the metabolic syndrome incidence ranged from 18-46%. [17-21] In accordance to our findings, a previous study reported the overall prevalence of metabolic syndrome as 38.98% in adults.[22] Other researchers also reported comparable results to the findings of this study from South Korea (30.52%), Morocco (35.73%) and Northwestern Nigeria (35.1%).[23,24,25] Though, this study reported, that the prevalence of metabolic syndrome is high than a previous study reported by Owolabi et al. in South Africa who reported 21.8% prevalence of metabolic syndrome.[26]The high metabolic syndrome prevalence in adults from Bahawalpur might be attributed due to hypertension, obesity and diabetes in this population, all of which are prevalent in this area. Lifestyle and genetics may also play a role in this phenomenon. In this study, 156 (60%) female participants and 104 (40%) male were observed with metabolic syndrome. These findings are in accordance with the previous study who reported 40.12% metabolic syndrome prevalence in female and 18.56% in male participants. [24]Another study also reported high prevalence in female.[27] In contrary to our study a previous study done by Santos et al. reported high prevalence of metabolic syndrome in male as compared to female.[28] These findings may be related to the various cut-off points used as metabolic syndrome criteria, such as hypertriglyceridemia, low HDL cholesterol and abdominal obesity. The amount of circulating estrogen in menopausal women decreased. Because of its impact on obesity, lipid metabolism, and prothrombotic state, estrogen deficiency may raise the risk of cardiovascular disease in women.[29] The increased incidence of metabolic syndrome in females of all ages may be associated with the elevated prevalence of obesity amongst female study participants. It may possibly be due to a fast decline in endothelial function in women following menopause.[30] Metabolic syndrome is spreading significantly in less developed countries, according to several researches.[31,32] Growing development, modernization of lifestyle (such as poor food and no exercise), and a knowledge lack might be contributing factors to this.

When compared to normal individuals, those with metabolic syndrome had increased total cholesterol, glycaemia, diastolic blood pressure and were likely to have hypertension, abdominal obesity and diabetes. Metabolic dysfunctions such as hypertension, obesity and hyperglycemia have been implicated as risk factors for the metabolic syndrome in previous research.[33,34]

Obese participants having OR of 15.77 and overweight with OR of 6.55 were at high risk to develop metabolic syndrome in our study. Individuals having age ≥51 years with OR 6.11 had also high risk to develop metabolic syndrome. Based on our study findings, the most common and important factors that affect participants were hyperglycemia (OR: 4.84), high blood pressure (OR: 4.31), abdominal obesity (OR: 350.55), high-TG (OR: 5.81) and low-HDL (OR: 10.3). The most important risk factor for metabolic syndrome is obesity and our findings are in line with the other previous studies. [24,35]

The major strength of the present study is that it is one of the few studies on metabolic syndrome in Pakistan with a high sample size. The findings of this research will undoubtedly aid in the sensitization and prevention of metabolic syndrome in the district Bahawalpur. But, there are a few drawbacks to consider. First and foremost, the cross-sectional design restricts the capacity to investigate causal connections between risk variables and metabolic syndrome in the study population. Secondly, there was a single blood sample evaluation of the prevalence of metabolic syndrome that may result in small errors.

CONCLUSION

This study concludes that metabolic syndrome is high prevalent in our population with female predominance. Based on our study findings, the most common and important factors that affect participants were hyperglycemia, high blood pressure, abdominal obesity, high-TG and low-HDL. The findings indicate that abdominal obesity is the best predictor of metabolic syndrome. The results of current study emphasize the importance of evidence-based protection, diagnosis, and treatment of metabolic syndrome and its related variables amongst adults in Bahawalpur area, Pakistan.

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