

Prevalence of the Metabolic Syndrome in Low Socio-Economic Urban Population.

Sumera Nawaz Qabulio¹, Sohail Akhtar², Faisal Ziauddin³, Waheeba Khan⁴, Saleem Akbar Afridi⁵

ABSTRACT

OBJECTIVE: To determine the prevalence of metabolic syndrome in a low socioeconomic group in urban population and its association with different variables.

STUDY DESIGN: A cross sectional observational study.

PLACE AND DURATION: Study was conducted in Dr. Ziauddin University and Hospital, Karachi for six months from 30th June 2013 to 29th December 2013.

METHODOLOGY: A total of 246 patients of either gender with age 30 to 65 years and monthly income less than rupees 15,000, had less than 12 years of formal education were enrolled in the study. WHO criteria was used for the diagnosis and classification of diabetes. Sitting blood pressure, Waist circumference, Body weight and height were measured. Patients with diabetes, hypertension, central obesity and hyperlipidemia were enrolled. Variables like gender, age, BMI, SBP, DBP, educational status, employment status, fasting blood sugar, triglyceride, High density lipoproteins (HDL), antihypertensive treatment, anti-diabetes treatment, and history of ischemic heart disease were studied in patients with metabolic syndrome.

RESULTS: Metabolic syndrome prevalence in low socioeconomic groups shows a significant association with gender, monthly income, fasting blood sugar, triglycerides, anti-hypertensive treatment and history of ischemic heart disease with $p \leq 0.05$. No significant association was found with age, BMI, education, employment status, and treatment of diabetes with $p > 0.05$.

CONCLUSION: Lower socioeconomic status in urban population was associated with higher risks of Metabolic Syndrome.

KEYWORDS: Metabolic syndrome, Prevalence, Urban population, Socioeconomic status, Blood sugar, Lipid profile.

HOW TO CITE THIS:

Qabulio SN, Akhtar S, Ziauddin F, Khan W, Afridi SA. Prevalence of the Metabolic Syndrome in Low Socio-Economic Urban Population. *Isra Med J.* 2018; 10(5): 291-295.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-Noncommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Metabolic syndrome is a constellation of risk factors, including obesity, insulin resistance, hyperglycemia, hypertension, dyslipidemia (increased cholesterol and triglycerides, low high density lipoproteins) that confer significantly increased risk of developing cardiovascular disease and diabetes mellitus.¹ A variety of studies indicate diverse components to be most frequent in occurrence. In a European study High density lipoprotein was the most commonly occurring factor (87.6% of the subjects), followed by obesity in 34.7%. Increase in lipid levels has been known to be exacerbated by insulin resistance in diabetic patients which is a strong predictor of atherogenic coronary artery disease.¹⁻³

Metabolic Syndrome is known to increase the risks of Coronary Artery Disease (CAD), stroke, and type-2 diabetes.^{4,5} Recent surveys from Pakistan and India show that the prevalence of Metabolic syndrome is 34.8% and 25.3% respectively.^{6,7} Its prevalence in Pakistan is showing an upward trend.⁸

There are no well-accepted criteria for diagnosing the metabolic syndrome. The criteria proposed by the National Cholesterol Education Program Adult Treatment Panel III (NCEPATP III), with minor modifications, were currently recommended and widely used. Other criteria were those of the World Health Organization

1. Registrar
2. Professor
3. Associate Professor

Department of Medicine,
Dr. Ziauddin University and Hospital, Karachi

4. Medical Registrar, Cheltenham General Hospital, UK
5. Post Graduate Trainee, Medicine Department,
Dr. Ziauddin University and Hospital, Karachi

Correspondence to:

Dr Faisal Ziauddin
Dr. Ziauddin Hospital, Karachi.
Email: faisaldrfz38@gmail.com

Received for Publication: 05-01-17
1st Revision of Manuscript: 03-04-17
2nd Revision of Manuscript: 22-06-17
3rd Revision of Manuscript: 06-07-17
4th Revision of Manuscript: 16-08-17
5th Revision of Manuscript: 14-03-18
6th Revision of Manuscript: 22-03-18
7th Revision of Manuscript: 19-04-18
8th Revision of Manuscript: 06-07-18
9th Revision of Manuscript: 03-09-18
Accepted for Publication: 01-10-18

(WHO), the International Diabetes Federation (IDF), and the American Heart Association (AHA).⁸

Socioeconomic status is a summary indicator that is often used in health and biomedical research. It is a multi-dimensional concept encompassing an individual's access to social and economic resources. Diet related non-communicable disease, resulting from largely preventable risk factors, is responsible for most of the world's health problems. South East Asia, has to experience great burden of chronic disease on its health and economy.⁹ Coronary heart disease remains the leading contributor to adult deaths (35-65 years), followed by cancer and diabetes.¹⁰ It is expected that 4 out of 5 deaths in the 3rd world, by 2025, will be due to chronic diseases, with 3 out of 4 people having diabetes.¹¹

Metabolic syndrome is on a rise in developing countries and individuals having metabolic syndrome are twice as likely to develop cardiovascular disease with a five-fold increased risk of diabetes mellitus, over the next 5-10 years.^{12,13} Objective of the study is to determine the prevalence of metabolic syndrome in a low socioeconomic urban population and to identify significant associations with different variables.

METHODOLOGY

This is a prospective cross sectional observational study, conducted in Dr. Ziauddin University & Hospital Karachi. Patients were enrolled for six months, from 30th June 2013 to 29th December 2013. Sample size is 246, and sampling technique used is non-probability consecutive sampling. Males and females aged 30-65 years, with a monthly income of less than PKR 15,000 and less than 12 years of formal education were included. Patients with ascites, chronic liver, kidney, or heart disease, malignancy, Cushing's disease, hypothyroid and those with secondary hypertension were excluded. Patients on systemic steroids, familial dyslipidemias, type 1 diabetics and pregnant patients were also excluded.

International Diabetes Federation criteria was used for diagnosing metabolic syndrome, with adoption of Asian criteria for abdominal obesity.¹³ According to this criteria at least 3 of the below mentioned must be present for a person to have metabolic syndrome. Central obesity (waist circumference in men $\geq$ 90cm and in women $\geq$ 80cm); Blood glucose fasting (greater than 100mg/dl or known case of Type II diabetes mellitus); Blood pressure $>$ 130/85 or known hypertensive); Triglyceride levels $>$ 150mg/dl); high-density lipoproteins cholesterol (in men $<$ 40mg/dl and in women $<$ 50 mg/dl). Specifically designed form was used by resident (SA) to collect the data from the patients visiting the medicine OPD. Informed consent was taken after fully explaining the procedure and objective of the study. The number of completed years of education were recorded and categorized into 3 levels, less than 5, 5-9 and 10-12 years. Participants currently engaged in a remunerated occupation were classified as active and others as inactive (retired, unemployed, housewives). Bio-data and history of diabetes, hypertension and ischemic heart disease were recorded. WHO criteria was used for the diagnosis and classification of diabetes.

Samples for blood glucose and lipid profile were taken after an over-night fast. Sitting blood pressure was measured in patient's right arm after taking 10 minutes rest. Two readings were taken and the mean was used for analysis. Waist circumference was measured with the subject standing with a flexible and non-distend able tape, midway between the lower limit of the rib cage and iliac crest. Body weight was measured to the nearest 0.1 kg using a digital scale and height measured to the nearest centimeter using a wall stadiometer. Data were then be processed by a single blind analyzer and were entered on the approved Performa.

Data Analysis: SPSS-17 was used for statistical analysis. Result was expressed as mean $\pm$ SD, frequency and percentages for all continuous variables. Stratification with respect to age, gender, BMI, central obesity, raised FBS, BP, TGL, and low HDL, educational and economic status, antihypertensive and antidiabetics was done. Post stratification Chi-square test was applied. P value less than or equal to 0.05 was taken as significant.

RESULTS

Total of 246 patients were enrolled with age of 30 to 65 years. Descriptive statistics of weight, height, BMI, waist circumference, systolic blood pressure, and diastolic blood pressure were calculated. It was found that mean weights of study subjects was 78.76 ± 1.98 with range 10(74-84) Kg. The mean height was 165.32 ± 9.85 m² with range 33(148-181) m². The mean of BMI was 29.13 ± 3.69 Kg/m² with range 13.78(23.20-36.98) Kg/m². The mean waist circumference was 98.45 ± 7.39 cm with range 27 (85-112) cm. The mean systolic blood pressure was 135.00 ± 2.04 mmHg with range 10(130-140) mmHg. The mean diastolic blood pressure was 89.07 ± 1.91 mmHg with range 7(86-93) mmHg (Table-I).

Table – I: Frequency of weight, height, SBP, DBP, waist circumference, and BMI (N=246)

	Mean $\pm$ SD	Median (IQR)	Range	Min	Max
Weight (Kg)	78.76 $\pm$ 1.98	79 (3)	10	74	84
Height (m²)	165.32 $\pm$ 9.85	166 (14)	33	148	181
BMI (Kg/m²)	29.13 $\pm$ 3.69	28.67 (5.73)	13.78	23.2	36.98
Waist Circumference (cm)	98.45 $\pm$ 7.39	102 (14)	27	85	112
Systolic Blood Pressure (mmHg)	135.00 $\pm$ 2.04	135 (3)	10	130	140
Diastolic Blood Pressure (mmHg)	89.07 $\pm$ 1.91	89 (2)	7	86	93

The mean monthly income was 11674.80 ± 1527.94 PKR with range 5000 (9000 - 14000) PKR. It was observed that monthly income of 23 study subjects was 9000 PKR, 10000 PKR of 44 subjects, 11000 PKR of 36 subjects, 12000 PKR of 63 subjects, 13000 PKR of 47 subjects, and 14000 of 33 study subjects. (Table- II)

There were 12.2% illiterate subjects, 26.0% subjects had education < 5 years, 44.7% had 5-9 years of education, and 17.1% subjects had 10-12 years of education. 174 study subjects were active and 72 subjects were inactive in employment status. Descriptive statistics of laboratory findings including total cholesterol, fasting blood sugar, high density lipoprotein (HDL), and triglycerides were calculated. The mean cholesterol level was 5.97 ± 0.55 mmol/L with range 2.91(4.26-7.17) mmol/L. The mean fasting blood sugar was 110.76 mg/dl with range 47(90-137) mg/dl. The mean High Density Lipoprotein was 1.11 ± 0.13 mmol/L with range was 0.38(0.95-1.33) mmol/L. The mean Triglycerides level was 150.08 ± 5.08 mg/dl with range 17(143-160) mg/dl. Prevalence of Metabolic Syndrome among study subjects was also evaluated. It was found that out of total 246 study subjects 171 (69.5%) have Metabolic Syndrome.

The association of Metabolic Syndrome was observed with low monthly income by applying chi square test considering p-value ≤ 0.05 as significant. The results showed that metabolic syndrome is significantly associated with low monthly income at $p \leq 0.05$ level.

Table-II: Frequency and association of metabolic syndrome with low monthly income (N=246)

		Metabolic Syndrome		P-value
		Yes (n=171)	No (n=75)	
Low Monthly Income (PKR)	9000 (n=23)	18	5	0.05*
	10000 (n=44)	36	8	
	11000 (n=36)	27	9	
	12000 (n=63)	44	19	
	13000 (n=47)	25	22	
	14000 (n=33)	21	12	
TOTAL		171	75	246

P-value ≤ 0.05 considered as Significant

* Significant at 0.05 level

Stratification with respect to gender, age, BMI, SBP, DBP, educational status, employment status, fasting blood sugar, triglyceride, HDL, antihypertensive treatment, anti-diabetes treatment, and history of ischemic heart disease was done against prevalence of metabolic syndrome. Post stratification chi-square test was applied and P-value ≤ 0.05 was considered as significant. 107(171) 46% of the patients with metabolic syndrome had BMI of less than 29.5 and 64(171) 37.4% had BMI of more than 29.5. 94(171) 54.9% patients with metabolic syndrome had systolic blood pressure of less than 135mmHg and 77(177) 43.5% had systolic blood pressure of more than 135mmhg. 136(171) 79% of patients with metabolic syndrome had diastolic blood pressure of less than 90% and 36(171) had greater than 90 mmHg. (Table-III).

Table-III: Frequency and association of metabolic syndrome with gender, age group, bmi, and blood pressure (N=246)

		Metabolic Syndrome		P-Value
		Yes (n=171)	No (n=75)	
Gender	Male (n=148)	110	38	0.04*
	Female (n=148)	61	37	
Age Groups (years)	≤ 48 (n=122)	87	35	0.54**
	> 48 (n=124)	84	40	
BMI (Kg/m ²)	≤ 29.5 (n=147)	107	40	0.20**
	> 29.5 (n=99)	64	35	
Systolic Blood Pressure (mmHg)	≤ 135 (n=142)	94	48	0.18**
	> 135 (n=104)	77	27	
Diastolic Blood Pressure (mmHg)	≤ 90 (n=190)	135	55	0.33**
	> 90 (n=56)	36	20	

P-value ≤ 0.05 considered as Significant

* Significant at 0.05 level

** Not Significant at 0.05 level

90(171) 52.63% patients with metabolic syndrome had fasting blood sugars greater than 110mg/dl, 117(171) 68.4% with triglycerides more than 150mg/dl, and 141(171) 82.4% had high density lipoproteins less than 1.04mmol/L in males and 1.3mmol/L in female. (Table-IV).

Table-IV: Frequency and association of metabolic syndrome with laboratory findings (N=246)

		Metabolic Syndrome		P-Value
		Yes (n)	No (n)	
Fasting Blood Sugar (mg/dl)	≤ 110 (n=147)	81	66	0.00*
	> 110 (n=99)	90	9	
Triglycerides (mg/dl)	< 150 (n=129)	54	75	0.00*
	≥ 150 (n=117)	117	0	
HDL (mmol/L)	≥ 1.04 for Men ≥ 1.3 for women (n=60)	30	30	0.00*
	< 1.04 for Men < 1.3 for women (n= 186)	141	45	

P-value ≤ 0.05 considered as Significant

* Significant at 0.01 level

146 (171) 85% patients with metabolic syndrome had history of antihypertensive treatment, 113(171) 66% had history of antidiabetic treatment and 65(171) 38% with history of ischemic heart disease. (Table-V).

Table-V: Frequency and association of metabolic syndrome with treatment history (N=246)

		Metabolic Syndrome		P-Value
		Yes (n=171)	No (n=75)	
Anti-Hypertensive Treatment	Yes (n=194)	146	48	0.00*
	No (n=52)	25	27	
Anti-Diabetes Treatment	Yes (n=163)	113	50	0.92**
	No (n=83)	58	25	
History of Ischemic Heart Disease	Yes (n=110)	65	45	0.00*
	No (n=136)	106	30	

P-value ≤ 0.05 considered as Significant

* Significant at 0.01 level

** Not Significant at 0.05 level

The results showed that no significant association of metabolic syndrome was observed with age, BMI, systolic blood pressure, diastolic blood pressure, educational status, employment status, and anti-diabetes treatment with $p > 0.05$. The significant association of metabolic syndrome was observed with gender, monthly income, fasting blood sugar, triglycerides, HDLC, anti-hypertensive treatment, and history of ischemic heart disease with $p \leq 0.05$.

DISCUSSION

Type II Diabetes and Cardiovascular disease are the two main indicators for the identification of the metabolic syndrome¹⁴. Timely detection and treatment of cardiovascular diseases is important in decreasing its prevalence in a given population.^{5, 15} Socioeconomic status is found to be inversely proportional to Metabolic Syndrome. Studies showed inverse and strong relationship between educational status and presence of Metabolic Syndrome.¹⁶ Modification of life style may have an impact in such groups. A South Korean study concluded that metabolic syndrome was significantly prevalent in people with low socioeconomic status.¹⁷ The association of literacy and socioeconomic status with Metabolic syndrome was mostly seen among females as they are more prone to socioeconomic inequalities.¹⁸ Moreover, the physical fitness of women in subcontinent is quiet neglected, as they are not encouraged to take decision of their health and seek primary health care without allowance of head of family and accompanied by a male member. Sedentary life style and obesity leads to metabolic syndrome.¹⁹ Assumption can be made that the population in our study would be affluent (through cost of examination) and their health behavior and attitude can be different from the general population. This could be one reason for high prevalence of metabolic syndrome. One study conducted in china on adults showed significant inverse relationship between metabolic syndrome and socioeconomic status in women but not in men. In our study prevalence of Metabolic Syndrome was found to be 69.5%. In comparison a study done in Korea showed a higher prevalence²⁰, and lower in another US based study.^{21, 22} Age group and selection criteria for metabolic syndrome might be a confounding factor. Our results showed that 64.3% males and

35.7% females had Metabolic Syndrome. The results being similar to those of studies conducted in the past.

The prevalence of Metabolic Syndrome is high among obese, and increases with increasing obesity.²² There is paucity of data from other South Asian countries of Bangladesh, Nepal, Pakistan, and Sri Lanka. In National Health and Nutrition Examination Survey (NHANES) III data, the prevalence differed little among men (24.0%) and women (23.4%).²³ However, in many of the studies worldwide and in Indian subcontinent, women had a higher prevalence of metabolic syndrome.²⁴⁻²⁶

STUDY LIMITATIONS

Some limitations of the present study must be highlighted. Study was cross-sectional in nature and duration of the metabolic syndrome is actually not known to us. The sample size is small and the study cannot be generalized to the whole population of Pakistan. The prevalence of metabolic syndrome in our sample was relatively common, it is possible that we may have overestimated the magnitude of the observed associations. The information like income status was gathered only by the patients who were part of the study.

CONCLUSION

Lower socioeconomic status in urban population was associated with higher risks of Metabolic Syndrome.

CONTRIBUTION OF AUTHORS

Qabulio SN: Manuscript writing
Akhtar S: Conceived idea, Designed research methodology.
Ziauddin F: Proof reading, Bibliography
Khan W: Data collection and Analysis.
Afridi SA: Data collection.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

REFERENCES

- Ahmad M, Hassan S, Hafeez F, Jajja A. Prevalence of various components of metabolic syndrome in our younger population. *Pak J Physiol.* 2011;7(2):46-49.
- Tytmonas G. The influence of increased BMI and abdominal obesity on the development of metabolic syndrome. *Medicina.* 2006;42(2):123–29.
- Esteghamati A. Metabolic syndrome and insulin resistance significantly correlate with body mass index. *Arch Med Res.* 2008; 39(8):803–808.
- World Health Organization: Global recommendations on physical activity for health. Geneva: WHO 2010. Website[http://apps.who.int/iris/bitstream/10665/44399/1/9789241599979_eng.pdf]
- World Health Organization: Global health risks: mortality and burden of disease attributable to selected major risks.

- Geneva: World Health Organization; 2009. Website[http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf]
6. Misra A, Khurana L. The Metabolic Syndrome in South Asians: Epidemiology, Determinants, and Prevention. *Metab Syndr Relat Disord*. 2009;7:497-514
 7. Katulanda P, Ranasinghe P, Jayawardana R, Sheriff R, Matthews DR. Metabolic syndrome among Sri Lankan adults: prevalence, patterns and correlates. *Diabetol Metab Syndr*. 2012;4(1):24.
 8. Hydrie MZ, Shera AS, Fawwad A, Basit A, Hussain A. Prevalence of metabolic syndrome in urban Pakistan (Karachi): comparison of newly proposed international diabetes federation and modified adult treatment panel III criteria. *Metab Syndr Relat Disord*. 2009;7(2):119-24.
 9. Mehan M, Bhalla R, Kohli C, Kantharia NB. Efficacy of using WHO's stepwise approach to identify "at risk" subjects for diet related non-communicable diseases. *Int J Med Sci Public Health*. 2012;1 (2):43-51.
 10. World Health Organization. Preventing Chronic Diseases. A Vital Investment: WHO Global Report. Geneva: WHO, 2005. Website [http://apps.who.int/irls/bltstream/10665/43314/1/9241563001_eng.pdf]
 11. Alvi SFD, Hydrie MZI, Fawwad A, Basit A, Riaz M, Shera AS. Ethnic differences in metabolic syndrome among South Asians of Pakistan. *Pak J Med Sci*. 2011;27(3):484-89.
 12. Alberti KG. Harmonizing the Metabolic Syndrome. A Joint Interim Statement of the International Diabetes Federation Task Force on Epidemiology and Prevention; National Heart, Lung, and Blood Institute; American Heart Association; World Heart Federation; International Atherosclerosis Society; and International Association for the Study of Obesity. *Circulation*. 2009. 120(16):1640-45.
 13. Syed M, Syeda UR, Habib M, Zahid R, Bashir A, Rabbani M, et al. Knowledge, attitudes and practices regarding Dengue Fever among adults of high and low socio-economic groups. *J Pak Med Assoc*. 2010;60:243
 14. Wannamethu SG, Shaper AG, Lennon L, Morris RW. Metabolic syndrome vs Framingham risk score for prediction of coronary heart disease, stroke and type 2 diabetes mellitus. *Arch Intern Med*. 2005;165:2644-50
 15. D.S Prasad, Z Kabir, B.C Das. Prevalence and risk factors for metabolic syndrome in Asian Indians: A community study from urban Eastern India. *J Cardiovasc Dis Res*. 2012;3 (3)204-211.
 16. Lidfeldt J, Nyberg P, Nerbrand C, Samsioe G, Shersten B, Agardh CD. Sociodemographic and psychological factors are associated with features of metabolic syndrome: the Women's Health in Lund Area (WHILA) study. *Diab Obes Metab*. 2003; 5(2):106-12.
 17. Kim MH, Kim MK, Choi BY, Shin YJ. Educational disparities in the metabolic syndrome in a rapidly changing society—the case of South Korea. *Int J of Epidemiol*. 2005; 34(6):1266-73.
 18. Khuwaja AK, Kadir MM. Gender differences and clustering pattern of behavioural risk factors for chronic non-communicable diseases: community-based study from a developing country. *Chronic Illness*. 2010; 6(3):163-70.
 19. Kim HM, Park J, Kim HS, Kim DH. Prevalence of the metabolic syndrome in Korean adolescents aged 12-19 years from the Korean National Health and Nutrition Examination Survey 1998 and 2001. *Diabetes Res Clin Pract*. 2007; 75:111-14.
 20. Seo MJ, Seong JW, Sohn KJ, Ko BJ, Han JH, Kim SM. Prevalence of the metabolic syndrome in Korean children and adolescents: Korea National Health and Nutrition Survey 2001. *J Korean Acad Fam Med*. 2006; 27:798-806.
 21. de Ferranti SD, Gauvreau K, Ludwig DS, Neufeld EJ, Newburger JW, Rifai N. Prevalence of the metabolic syndrome in American adolescents: findings from the third National Health and Nutrition Examination Survey. *Circulation*. 2004 19;110(16):2494-7.
 22. Cook S, Weitzman M, Auinger P, Nguyen M, Dietz WH. Prevalence of metabolic syndrome phenotype in adolescents: findings from the third National Health and Nutrition Examination Survey, 1988-1994. *Arch Pediatr Adolesc Med*. 2003; 157:821-27.
 23. Park YW, Zhu S, Palaniappan L, Heshka S, Carnethon MR, Heymsfield SB. The Metabolic Syndrome: Prevalence and Associated Risk Factor Findings in the US Population from the Third National Health and Nutrition Examination Survey, 1988-1994. *Arch Intern Med*. 2003; 163: 427-36.
 24. Mabry RM, Reeves MM, Eakin EG, Owen N. Gender differences in prevalence of the metabolic syndrome in Gulf Cooperation Council Countries: a systematic review. *Diabet Med*. 2010; 27: 593-97.
 25. Jesmin S, Islam R, Islam S, Mia S, Sultana SN, Zaedi S, et al. Comprehensive assessment of metabolic syndrome among Rural Bangladeshi Women. *BMC Public Health*. 2012;12: 49.
 26. Saltiki K, Cimponeriu A, Lili K, Peppia M, Anastasiou E, Alevizaki M. Severity of coronary artery disease in postmenopausal diabetic women. *Hormones*. 2008;7: 148-55.