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Original Article

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Prevalence of metabolic syndrome and its components among the teaching faculty of Allama Iqbal Medical College and Jinnah Hospital Lahore.

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ABSTRACT

BACKGROUND & OBJECTIVE: Metabolic syndrome and its components are established risk factors for type-2 diabetes mellitus and cardiovascular diseases. The Objectives of the current study were to assess the mean values of cardiometabolic risk factors and anthropometric parameters among the teaching faculty of Allama Iqbal Medical College and Jinnah Hospital Lahore (AIMC/JHL). To investigate the prevalence of metabolic syndrome and its components.

METHODOLOGY: This cross-sectional study was conducted from December 2022 to July 2023 at AIMC/JHL. Faculty members (n=115), aged 30-60, were recruited by convenience sampling from basic and clinical departments. Metabolic syndrome was defined by ATP-III criteria. Means of quantitative variables were compared by student t-test. Chi-square was used to determine associations between nominal variables.

RESULTS: Mean values of arterial blood pressure were significantly higher in males than females. Fasting hyperglycemia was present in 38.3% of participants. Decreased HDL, hypertriglyceridemia, hypertension, and central obesity were found in 65.2%, 24.3%, 34.8%, and 74.8% of participants, respectively. The prevalence of low HDL and central obesity was significantly higher among females; however, hypertriglyceridemia and hypertension were more prevalent among males. A significant correlation (r=0.241) was observed (p=0.009) between age and waist circumference. Pre-metabolic syndrome and metabolic syndrome were present in 38.3% and 43.5% of participants, respectively.

CONCLUSION: An alarmingly high prevalence of metabolic syndrome and its components was observed among healthcare professionals who endeavor to treat similar diseases. This irony underscores the need for increased awareness and routine screening of metabolic syndrome among healthcare professionals.

KEYWORDS: Metabolic syndrome, Abdominal obesity, Dyslipidemia, Glucose intolerance, Occupational health.

INTRODUCTION

Metabolic syndrome is a clustering of several risk factors of non-communicable diseases. These risk factors which make up the components of metabolic syndrome include insulin resistance, hyperglycemia, increased blood pressure, central obesity, and dyslipidemia [1,2]. The presence of metabolic syndrome raises the chances of developing cardiovascular diseases and diabetes mellitus leading to increased morbidity and mortality [3,4]. Metabolic syndrome in the workforce not only increases the healthcare cost for employees and their employers but also decreases their productivity because of increased chances of absenteeism and presenteeism [5,6].

Metabolic syndrome is a lifestyle-related disease. Its risk is higher among those employees who remain relatively inactive during most of their work hours [7,8]. Metabolic syndrome is also an occupational health issue among healthcare workers. Job stress, the demanding nature of the job, and the imbalance between efforts and rewards are some of the factors that increase risk among healthcare providers [9].

It has been highly recommended to screen employees to identify the ones who have full metabolic syndrome, pre-metabolic syndrome, or any of the five components of metabolic syndrome. Early detection and management of the components of metabolic syndrome can help reduce the progression towards the development of diabetes mellitus

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and cardiovascular diseases [10]. It can also increase the overall well-being and productivity of the employees [11]. It is important for healthcare providers and medical teachers that they keep themselves fit to be able to serve their stakeholders efficiently. Moreover, by staying fit they can also be role models and can effectively advocate the benefits of health promotion.

The prevalence of metabolic syndrome was found to be 18.3% in the year 2018 among physicians in Taiwan [12]. In a study that was conducted in 2008 among medical doctors in Bahawalpur Pakistan, the prevalence of metabolic syndrome was found to be about 15% [13]. As changes in sociodemographic parameters of the population, over the years, can change the prevalence of metabolic syndrome and its components,[2] there is a need to find the present status of cardiometabolic health of healthcare professionals. There seems a dearth of recent data on the prevalence of metabolic syndrome among medical doctors in Pakistan. The Objectives of the current study were to assess the mean values of cardiometabolic risk factors and anthropometric parameters among the teaching faculty of Allama Iqbal Medical College and Jinnah Hospital Lahore (AIMC/JHL). To investigate the prevalence of metabolic syndrome and its components among the study participants.

METHODOLOGY

This cross-sectional study was conducted at Allama Iqbal Medical College and Jinnah Hospital Lahore from December 2022 to July 2023. Ethical approval was sought and obtained (Ref No: 160/25/11/2021/S2 ERB) from the Ethical Review Board of Allama Iqbal Medical College and Jinnah Hospital Lahore. The confidentiality of the participants was maintained throughout the study. Moreover, the study was conducted in line with the ethical principles described in the Declaration of Helsinki. SPSS-21 was used to enter and analyze research data. Quantitative variables and categorical variables were described by mean ± SD and frequencies (percentages), respectively. The means of the quantitative variables were compared by the student t-test. Furthermore, to investigate the comparison between variables, the chi-square test was used. A p-value ≤ 0.05 was considered statistically significant.

The study participants were teaching faculty from the basic and clinical departments of the institute. We recruited 115 participants that were slightly more than the required sample. The sample size was calculated to be 103 at a 95% confidence interval, with a 5% margin of error and keeping the anticipated frequency of metabolic syndrome at 10%. The total number of medical teachers (population size) in all the basic and clinical departments of the institute was about 400. Inclusion criteria were that teaching faculty members of any gender, at any designation, aged 30-60 years, from any of the basic or clinical departments of AIMC/JHL will be included. Pregnant women and support staff were excluded from the study. Demonstrators, senior demonstrators, senior registrars, assistant professors, associate professors, and professors were recruited by convenience sampling.

Data was collected using a researcher-administered proforma that was designed by a team of physiologists. This data collection tool contained information related to the biodata of the participants, sociodemographic parameters, anthropometric variables, and some biochemical and physiological parameters.

Potential participants in each department were informed about the nature and scope of the study through an information sheet. Interested participants took part in the study after signing a written informed consent. Relevant information obtained from the participants was recorded on the data collection proforma. Height, weight, waist circumference, etc. were measured according to standard procedures. Systolic and diastolic blood pressures were checked by a digital BP monitor – Certeza BM-405.

After 12 hours of overnight fasting, about four mL of venous blood was drawn by aseptic technique. Blood sugar level was instantly determined by the glucometer – Certeza GL 110. The blood sample was transferred in a yellow-top vial followed by centrifugation. On the same day, serum was assayed for triglycerides (TGs), and high-density lipoprotein (HDL) by Atellica CH Analyzer version 1.25.0.4016001 (Siemens Healthineers).

According to the revised Adult Treatment Panel (ATP) III criteria,[14] each of the five components of metabolic syndrome was defined as follows:
1)Abdominal Obesity: waist circumference ≥ 36 inches (90 cm) for males and 32 inches (80 cm) for females.2) Raised systolic blood pressure ≥ 130 mmHg or diastolic BP ≥85 mmHg or the person is a known hypertensive using antihypertensive treatment.3)Increased fasting blood glucose ≥ 100 mg/dl (5.6 mmol/L) or previously diagnosed with diabetes mellitus.4)Increased triglyceride levels ≥ 150 mg/dl (1.7 mmol/L) or using treatment for this dyslipidemia. 5)Low HDL level in males < 40 mg/dl (1.03 mmol/L) and < 50 mg/dl (1.29 mmol/L) in females or using treatment for this dyslipidemia.
A participant with ≥ 3 of the above components was diagnosed as having metabolic syndrome and the participant with any two of the five components was labelled as having pre-metabolic syndrome.

RESULTS

A total of 115 participants were included in the study. The mean age of the participants was 40.61±8.8 (range 30-60) years. Males were 57 (49.6%) and females were 58 (50.4%) of the total participants. About 1/3rd of the participants, 39 (33.9%), were from basic science departments, and the rest of 76 (66.1%) were from clinical science departments. The mean job experience of the participants was 11.73±8.04 years. About 43 % (n=50) of them had <10 years of teaching experience. About 36 % (n=42) and 20% (n=23) of them had teaching experience of 10-20 years and >20 years, respectively. Information about some other characteristics of the participants e.g. their medical history and family history can be found in Table- I.

Table-I: Characteristics of the Study Participants.

variables	Parameters	n (%)
Age	Mean ± SD	40.61±8.80
	Range	30-60
Gender	Males	57 (49.6)
	Females	58 (50.4)
Department	Basic Sciences	39 (33.9)
	Clinical Sciences	76 (66.1)
The participant is known Diabetic	Yes	4 (3.5)
	No	111 (96.5)
The participant has been diagnosed with Hypertension	Yes	11 (9.6)
	No	104 (90.4)
The participant has been diagnosed Coronary artery disease	Yes	3 (2.6)
	No	112 (97.4)
The participant has a family history of Diabetes and/or coronary artery disease	Yes	74 (64.3)
	No	41 (35.7)
The participant uses lipid-lowering drugs	Yes	5 (4.3)
	No	110 (95.7)
The participant uses antihypertensive drugs	Yes	10 (8.7)
	No	105 (91.3)
Total job experience	< 10 years	50 (43.5)
	10-20 Years	42 (36.5)
	> 20 years	23 (20.0)

Table-II: Means values of cardiometabolic risk factors and anthropometric parameters in the total study participants

Parameters	Mean ± SD
Fasting Blood Glucose (mg/dL)	97.32 ± 22.62
Fasting HDL levels (mg/dL)	
Males	41.17 ± 11.54
Females	42.84 ± 12.23
Fasting TG levels (mg/dL)	127.75 ± 49.10
Systolic Blood Pressure (mmHg)	118.50 ± 14.39
Diastolic Blood Pressure (mmHg)	79.75 ± 9.63
Mean Blood Pressure (mmHg)	92.63 ± 10.40
Pulse Rate (bpm)	78.90 ± 10.30
Waist Circumference (cm)	
Males	94.12 ± 9.68
Females	87.76 ± 9.29
Height (cm)	166.46 ± 9.66
Weight (Kg)	73.17 ± 12.97
BMI (Kg/m2)	26.51 ± 3.93
Neck circumference (cm)	37.18 ± 3.43
Waist-to-Height Ratio	0.55 ± 0.06

Table-III: Comparison of the values of various cardiometabolic risk factors and anthropometric parameters between males and females .

Parameters	Gender	Mean ± SD	P-value
Fasting Blood Glucose (mg/dL)	Female	94.74 ± 14.82	0.219
	Male	99.95 ± 28.37	
Fasting HDL levels (mg/dL)	Female	42.84 ± 12.23	0.453
	Male	41.17 ± 11.54	
Fasting TG levels (mg/dL)	Female	119.24 ± 35.98	0.060
	Male	41.17 ± 11.54	
Systolic Blood Pressure (mmHg)	Female	119.24 ± 35.98	0.006*
	Male	136.42 ± 58.65	
Diastolic Blood Pressure (mmHg)	Female	114.90 ± 15.42	0.004*
	Male	122.16 ± 12.35	
Waist Circumference (cm)	Female	77.22 ± 10.23	0.000*
	Male	94.12 ± 9.68	
Pulse Rate (bpm)	Female	78.95 ± 10.83	0.956
	Male	78.84 ± 9.83	
Mean Blood Pressure (mmHg)	Female	89.90 ± 10.79	0.004*
	Male	95.40 ± 9.29	
Height (cm)	Female	159.62 ± 6.16	0.000*
	Male	173.41 ± 7.34	
Weight (Kg)	Female	66.42 ± 10.65	0.000*
	Male	80.05 ± 11.48	
BMI (Kg/m2)	Female	26.40 ± 4.34	0.164
	Male	26.63 ± 3.49	
Neck circumference (cm)	Female	34.77 ± 2.23	0.000*
	Male	39.64 ± 2.61	
Waist-to-Height Ratio	Female	0.55 ±0.06	0.318
	Male	0.54 ± 0.06	

*** Statistically significant**

Mean values of various cardiometabolic risk factors and anthropometric parameters among the total participants are presented in Table II. Mean values of these parameters were compared between male and female participants. Systolic blood pressure, diastolic blood pressure and mean blood pressure were some notable factors that were significantly higher in males than females (Table-III). A significant positive correlation (r=0.241) was observed (p=0.009) between age and waist circumference of the participants. No significant correlation was found between age and other components of the metabolic syndrome.

Fasting hyperglycemia was present in 44 (38.3%) of the total participants. Decreased HDL, hypertriglyceridemia, raised blood pressure, and increased waist circumference were found in 75 (65.2%), 28 (24.3%), 40(34.8%) and 86(74.8%) of the total participants, respectively. Prevalence of low HDL levels and central obesity were found to be significantly higher among females than in males. However, the occurrence of hypertriglyceridemia and raised blood pressure were found to be significantly more common among males than in females (Table- IV).

Table-IV: Prevalence of each component of metabolic syndrome among the study participants.

Component of Metabolic Syndrome	Total Participants n (%)	Females n (%)	Males n (%)	P-value
Fasting Hyperglycemia				
Yes (Present)	44 (38.3)	20 (34.5)	24 (42.1)	0.400
No (Normal)	71 (61.7)	38 (65.5)	33 (57.9)	
Decreased HDL				
Yes	75 (65.2)	43 (74.1)	32 (56.1)	0.043*
No (Normal)	40 (34.8)	15 (25.9)	25 (43.9)	
Hypertriglyceridemia				
Yes	28 (24.3)	09 (15.5)	19 (33.3)	0.022*
No (Normal)	87 (75.7)	49 (84.5)	38 (66.7)	
Raised BP				
Yes	40 (34.8)	13 (22.4)	27 (47.4)	0.004*
No (Normal)	75 (65.2)	45 (77.6)	30 (52.6)	
Increased Wais Circumference				
Yes	86 (74.8)	49 (84.5)	37 (64.9)	0.013*
No (Normal)	29 (25.2)	09 (15.5)	20 (35.1)	

Table-V: Participants having only one component of metabolic syndrome, two components of metabolic syndrome, and complete metabolic syndrome.

Prevalence of metabolic syndrome or its components	n (%)
Participants having only one of the five components of metabolic syndrome	14 (12.2)
Participants having any two components of metabolic syndrome (pre-metabolic syndrome)	44 (38.3)
Participants having full metabolic syndrome	50 (43.5)

Out of the total 115, just 7 (6.1%) participants did not show any component of the metabolic syndrome. However, 14 (12.2%) participants had any one of the five components of the metabolic syndrome. Pre-metabolic syndrome and metabolic syndrome were present in 44 (38.3%) and 50 (43.5%) of the participants, respectively (Table-V).

DISCUSSION

This study reveals an alarmingly high prevalence of metabolic syndrome among the teaching faculty of AIMC/JHL. Just 6.1% of the participants were healthy enough that they did not have any component of the metabolic syndrome. However, the prevalence of metabolic syndrome and pre-metabolic syndrome stood at 43.5% and 38.3%, respectively. It means almost two out of every five healthy-looking participants were suffering from metabolic syndrome and similar was the proportion of those with pre-metabolic syndrome. Such a high prevalence of metabolic syndrome and pre-metabolic syndrome among healthcare workers is worrisome as it is already established that metabolic syndrome increases the risk of diabetes mellitus and cardiovascular diseases [3,6,10].

Not only High prevalence of metabolic syndrome and pre-metabolic syndrome was observed in this study; but also, about 74% of the participants had a family history of diabetes and/or coronary artery disease. This necessitates regular screening of metabolic syndrome and pre-metabolic syndrome in such individuals as suggested previously by another study [15].

The prevalence of metabolic syndrome in our participants is higher than the prevalence (22.4%) observed among the hospital staff in Iran [8]. The prevalence of metabolic syndrome in our study is also much higher than the prevalence (14.95%) observed locally in 2011 among the medical community of Bahawalpur, Pakistan [13]. Furthermore, it is also higher than the average prevalence (21.27%) found previously among the workforce from various professions in Asia [2].

Such a high prevalence of metabolic syndrome among the medical community than the professionals in other fields raises serious concerns. It is because medical professionals who endeavor to treat similar diseases and disorders are themselves suffering from very high rates of metabolic syndrome. The high prevalence of metabolic syndrome found in this study may be attributed to the location of the study setting in one of the most urbanized cities i.e. Lahore and one of the largest tertiary care hospitals in the city. This urbanized setting may contribute to the increased occurrence of metabolic syndrome due to such factors as pollution, processed food, sedentary lifestyles, and demanding working hours as all of these factors are previously found to be associated with metabolic syndrome [2]. The most prevalent

component of metabolic syndrome in our participants was increased waist circumference (74.8%). Central obesity plays a pivotal role in causing insulin resistance and the development of metabolic syndrome [2,16]. This high prevalence of central obesity aligns with the prevalence of obesity (70.3%) in Pakistani urban areas [17]. However, it is higher than the national prevalence (23.7-50.5%) of central obesity in Pakistan [18]. As central obesity is associated with metabolic syndrome, weight loss, and dietary modifications may be beneficial in preventing and/or managing the metabolic syndrome [2,19].

Dyslipidemia in the studied population includes a notable prevalence of reduced HDL levels, ranking as the second most common component at 65.2%. This prevalence aligns closely with a study on the urban population of Pakistan, where low HDL was identified in 63.7% of individuals [17]. Another review confirmed that low HDL is the predominant form of isolated dyslipidemia in the Pakistani population with an overall prevalence of 30.8–65.6% across Pakistan [18]. Low HDL levels and Hypertriglyceridemia are interconnected components of dyslipidemia. Hypertriglyceridemia was found in 24.3% of our participants, notably lower than another study [17] on the Pakistani population where its prevalence was found to be 43.8%. The high prevalence of dyslipidemia in our population may be because of the consumption of junk and fatty food as they are readily available on the premises of the institute.

Fasting hyperglycemia was found in 38.3% of participants, and nationwide studies on metabolic syndrome prevalence have reported a range of 15.3% to 70.2% [17,18] with urban areas showing a higher prevalence (70%) [17]. As central obesity contributes to insulin resistance and hyperglycemia, so weight loss may lead to better glucose tolerance [2]. About 35% of our participants showed elevated blood pressure, aligning with findings from various studies conducted across Pakistan in the general population (20.0–54.9%) [17,18].

Hypertension is an important component and predictor of metabolic syndrome. Its significance can be understood by the findings of a study in which about 80% of cases of metabolic syndrome were detected by just two non-invasive parameters (blood pressure, and waist-to-hip ratio) [20]. Obesity can contribute to hypertension through sympathetic stimulation and increased production of TNF-α, IL-6, and angiotensin-II [21].

We also observed significant differences in the prevalence of individual components of metabolic syndrome between male and female participants. The prevalence of hypertension (47.4% men vs 22.4 % women) and hypertriglyceridemia (33.3% men vs 15.5% women) were significantly higher in men. However, the prevalence of low HDL levels (56.1% men vs 74.1% women) and central obesity (64.9% men vs 84.5% women) were significantly more prevalent in females. The disparity in the prevalence of hypertension between the two sexes can be attributed to differences in sex hormones and other biological sex variations, which protect females against hypertension [18,22].

Low HDL levels being more prevalent in our females, was contrary to the results of other regional studies on metabolic syndrome [2,17]. Hypertriglyceridemia is more prevalent in males consistent with previous studies [2,17]. Although, fasting hyperglycemia was found in almost one-third of participants of each gender; however, no significant distinction was observed in its occurrence between males and females. In short, although, there were differences in the prevalence of individual components of metabolic syndrome between male and female participants of our study; however, cardiometabolic health was generally poor among both genders.

Metabolic syndrome can lead to adverse impacts on socioeconomic and health-related aspects of life. Metabolic syndrome is associated with poor perceived health, increased days of illness, psychological stress/depression, higher healthcare costs, presenteeism, and absenteeism[2,11,23]. Presenteeism is being present at work but not being fully productive. Absenteeism is frequent or habitual absence from work. Both presenteeism and absenteeism lead to decreased productivity. All this is alarming and calls for immediate action. It is interesting to note that, as compared to Caucasians, South Asians are more likely can develop the following issues at a younger age: insulin resistance, hyperglycemia, atherogenic dyslipidemia, subclinical inflammation, and endothelial dysfunction [2,24]. This further necessitates the need for health promotion, and prevention of metabolic syndrome and its components in the healthcare professionals who are not immune to the effects of modern lifestyle.

We would like to recommend that healthcare professionals must be encouraged by their employers to live a healthy lifestyle e.g. smoking cessation, increased intake of fruits and vegetables, access to healthy food options at the cafeteria, and incorporating physical activity in daily life [2,7]. There must be policies in place that prioritize their wellbeing e.g. policy to restrict the promotion and marketing of unhealthy food items. Moreover, there should be regular campaigns to increase awareness of metabolic syndrome and its consequences. To promote the occupational health of their employees, employers may create opportunities to exercise at the worksite e.g. onsite gym[23]. Early screening and management of metabolic syndrome and its components can also decrease the future chances or delay the development of diabetes mellitus and cardiovascular diseases [10,15,20].

Research is required to explore the prevalence and trends of metabolic syndrome in the faculty of various medical colleges and hospitals across Punjab and Pakistan. Moreover, intervention-based studies are needed to investigate the link between adopting a workplace that encourages a healthy lifestyle and improvement in the cardiometabolic health of the employees.

To the best of our knowledge, this is the first research in Pakistan after 2011[13] that has studied and found an alarmingly high prevalence of metabolic syndrome among healthcare professionals. We have used ATP-III criteria to

define metabolic syndrome. The prevalence of metabolic syndrome may be slightly different if WHO criteria or International Diabetes Federation criteria are used [14]. Moreover, the cross-sectional nature of the study warrants cautious interpretation and generalization of the findings of this study.

CONCLUSION

We have found a very high prevalence of metabolic syndrome, pre-metabolic syndrome, and their components among the teaching faculty of a tertiary healthcare setup in Lahore. Healthcare professionals who teach and treat non-communicable diseases are themselves suffering from very poor cardiometabolic health. There is an urgent need to increase awareness of metabolic syndrome and its consequences among healthcare professionals. Moreover, metabolic syndrome should be identified earlier through routine screening. Employers must introduce health promotion programs at the workplace for their employees and should encourage them to adopt a healthy lifestyle.

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REFERENCES:

1. Fahed G, Aoun L, Bou Zerdan M, Allam S, Bou Zerdan M, Bouferraa Y, et al. Metabolic syndrome: updates on pathophysiology and management in 2021. International Journal of Molecular Sciences. 2022;23(2):786. Doi:10.3390/ijms23020786
2. Roomi MA, Mohammadnezhad M. Prevalence of metabolic syndrome among apparently healthy workforce. Journal Ayub Medical College Abbottabad. 2019;31(2):252-254.
3. Guembe MJ, Fernandez-Lazaro CI, Sayon-Orea C, Toledo E, Moreno-Iribas C. Risk for cardiovascular disease associated with metabolic syndrome and its components: a 13-year prospective study in the RIVANA cohort.Cardiovascular Diabetology. 2020;19:195. Doi:10.1186/s12933-020-01166-6
4. Lee MK, Han K, Kwon HS. Age-specific diabetes risk by the number of metabolic syndrome components: a Korean nationwide cohort study. Diabetology& Metabolic Syndrome.2019;11:112.Doi: 10.1186/s13098-019-0509-8
5. Hoang DV, Akter S, Inoue Y, Kuwahara K, Fukunaga A, Islam Z, et al. Metabolic syndrome and the increased risk of medically certified long-term sickness absence: a prospective analysis among Japanese workers. Journal of Epidemiology.2023;33(6):311-320.Doi: 10.2188/jea.JE20210185.
6. Watanabe J, Kotani K. Metabolic syndrome for cardiovascular disease morbidity and mortality among general Japanese people: a mini-review. Vascular Health Risk Management.2020;16:149-155. Doi:10.2147/VHRM.S245829.
7. Chen MS, Chiu CH, Chen SH. Risk assessment of metabolic syndrome prevalence involving sedentary occupations and socioeconomic status. BMJOpen.2021;11(12):e042802.Doi:10.1136/bmjopen-2020-042802.
8. Niazi E, Saraei M, Aminian O, Izadi N. Frequency of metabolic syndrome and its associated factors in health care workers. Diabetes Metabolic Syndrome. 2019;13(1):338-342. Doi: 10.1016/j.dsx.2018.10.013.
9. Lin YP, McCullagh MC, Kao TS, Larson JL. An integrative review: work environment factors associated with physical activity among white-collar workers. Western Journal of Nursing Research.2014;36(2):262-283. Doi: 10.1177/0193945913503417.
10. Dehghan A, Jahangiry L, Khezri R, Jafari A, Pezeshki B, Rezaei F, et al. Framingham risk scores for determination the 10-year risk of cardiovascular disease in participants with and without the metabolic syndrome: results of the Fasa Persian cohort study. BMC Endocrine Disorders. 2024;24(1):95. Doi: 10.1186/s12902-024-01621-5.
11. Schultz AB, Edington DW. Metabolic syndrome in a workplace: prevalence, co-morbidities, and economic impact. Metabolic Syndrome Related Disorders. 2009;7(5):459–468. Doi:10.1089/met.2009.0008.
12. Yeh WC, Chuang HH, Lu MC, Tzeng IS, Chen JY. The prevalence of metabolic syndrome among employees of a Taiwanese hospital varies according to profession. Medicine(Baltimore).2018;97(31):e11664.Doi: 10.1097/MD.0000000000011664.
13. Alam MF, Nasreen S, Ullah E, Hussain A. The awareness and prevalence of metabolic syndrome in the medical community of Bahawalpur. Oman Medical Journal. 2011;26(1):26-28. Doi: 10.5001/omj.2011.07.
14. Chackrewarthy S, Gunasekera D, Pathmeswaren A, Wijekoon CN, Ranawaka UK, Kato N, et al. A comparison between revised NCEP ATP III and IDF definitions in diagnosing metabolic syndrome in an urban SriLankan population:the Ragama health study.International Scholarly Research Notices. 2013;2013(1):320176. Doi:10.1155/2013/320176
15. Choi SK, Jo JA, Hwang SY. Prevalence of metabolic syndrome and its predicting factors among small-sized company workers. Korean Journal of Adult Nursing. 2014;26(2):244-252. Doi: 10.7475/kjan.2014.26.2.244

16. Barber TM, Kyrou I, Randeva HS, Weickert MO. Mechanisms of insulin resistance at the crossroad of obesity with associated metabolic abnormalities and cognitive dysfunction. International Journal of Molecular Sciences.2021;22(2):546. Doi:10.3390/ijms22020546
17. Ali NS, Khuwaja AK, Nanji K. Retrospective analysis of metabolic syndrome: Prevalence and distribution in executive population in urban Pakistan. International Journal of Family Medicine.2012;2012(1):649383. Doi:10.1155/2012/649383
18. Adil SO, Islam MA, Musa KI, Shafique K. Prevalence of metabolic syndrome among apparently healthy adult population in Pakistan: a systematic review and meta-analysis. In Health Care 2023; 11(4):531. MDPI. Doi:10.3390/healthcare11040531
19. Peng W, Liu Y, Malowany M, Chen H, Su X, Liu Y. Metabolic syndrome and its relation to dietary patterns among a selected urbanized and semi-urbanised Tibetan population in transition from nomadic to settled living environment. Public HealthNutrition. 2021;24(5):984-992. Doi:10.1017/S1368980019004798
20. Romero-Saldana M, Fuentes-Jimenez FJ, Vaquero-Abellan M, Alvarez-Fernandez C, Molina-Recio G, Lopez-Miranda J. New non-invasive method for early detection of metabolic syndrome in the working population. European Journal of Cardiovascular Nursing.2016;15(7):549–558.Doi:10.1177/1474515115626622.
21. Stanciu S, Rusu E, Miricescu D, Radu AC, Axinia B, Vrabie AM, et al. Links between metabolic syndrome and hypertension: The relationship with the current antidiabetic drugs.Metabolites.2023;13(1):87. Doi: 10.3390/metabo13010087
22. Vitale C, Fini M, Speziale G, Chierchia S. Gender differences in the cardiovascular effects of sex hormones. Fundamental&ClinicalPharmacology.2010;24(6):675–685.Doi:10.1111/j.1472-8206.2010.00817.x.
23. Alrahma AM, Habib MA, Oulhaj A, Loney T, Boillat T, Shah SM, et al. Effects of a workplace exercise intervention oncardiometabolic health: study protocol for a randomized controlledtrial. BMJOpen.2021;11(11):e051070. Doi:10.1136/bmjopen-2021-051070.
24. Wolf RM, Nagpal M, Magge SN. Diabetes and cardiometabolic risk in South Asian youth: A review. Pediatric Diabetes. 2021; 22(1):52-66. Doi:10.1111/pedi.13078.

Authors' Contribution:

Mudassar Ali Romi: Substantial contributions to the conception and design of the work.
Haneen Kamran : The acquisition and analysis of data for the work
Ahmad Bilal: Reviewing it critically for important intellectual content.
Umm-e-Aimen Minhas: Analysis and interpretation of data for the work.
Sameen Tahira: Drafting the work.
Hafiz Muhammad Qasim Zafar : Final approval of the version to be published

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