ISSN: 1607-8322, e-ISSN: 2220-5799 Anaesthesia, Pain & Intensive Care
Vol 28(2); April 2024 DOI: 10.35975/apic.v28i2.2419

SHORT COMMUNICATION PERIOPERATIVE MEDICINE

Prevalence of metabolic syndrome among patients with coronary artery disease in Basrah, Iraq

Mariam Atif Hammodi[1], Salman Ajlan[2], Mazzin Abd Hazza[3],

Author affiliations:

1. Mariam Atif Hammodi, Department of Biochemistry, College of Medicine, University of Basrah, Basrah, Iraq; E-mail: mariumatif324@yahoo.com
2. Salman Ajlan, Professor, Department of Biochemistry, College of Medicine, University of Basrah, Basrah, Iraq; E-mail: SalmanAjlan@yahoo.com
3. Mazzin Abd Hazza, Lecturer, Department of Biochemistry, College of Medicine, University of Basrah, Basrah, Iraq; E-mail: MazziAbdHazza@yahoo.com

Correspondence: Mohauman Mohammed Majeed; **E-mail:** muhaimin.alrufaie@uokufa.edu.iq; **Phone:** +964 07809086646

ABSTRACT

Background & Methods: Metabolic Syndrome (MetS) is a group of comorbidities including visceral obesity, dyslipidemia, hypertension, and impaired glycemic tolerance or diabetes. MetS has been associated with a considerable risk of coronary artery disease (CAD) and type 2 diabetes. We conducted this study to determine the frequency of MetS among patients with CAD in Basrah, Iraq.

Methodology: This study was conducted in Basrah Oil Specialized Hospital for Cardiovascular Medicine and Surgery, in Basrah, and included 150 patients with CAD, diagnosed by coronary angiography. Out of 150, 93 (62%) patients were males and 57 (38%) were females. We also included 150 apparently healthy individuals as controls; 93 (62%) males and 57 (38%) females. The age of both patients and controls were 40-80 y. Wight, height, waist circumference (WC), and blood pressure (BP) were measured. Biochemical parameters including fasting plasma glucose (FPG), high-density lipoprotein-cholesterol (HDL-C), and triglyceride (TG) were also measured.

Results: The frequency of MetS was significantly higher among patients with coronary artery disease than in controls ($P < 0.01$). Also, it is more frequent among females (88%) compared to males (73%).

Conclusion: The frequency of metabolic syndrome among patients with coronary artery disease is significantly higher compared to healthy population without heart disease.

Abbreviations: CAD - Coronary artery disease; FPG - Fasting plasma glucose; HDL-C - High-density lipoprotein-cholesterol; MetS - Metabolic Syndrome; TG - Triglyceride

Keywords: Coronary Artery Disease; Metabolic Syndrome; Insulin Resistance.

Citation: Hammodi MA, Ajlan S, Hazza MA. Prevalence of metabolic syndrome among patients with coronary artery disease in Basrah, Iraq. Anaesth. pain intensive care 2024;28(1):353−357; **DOI:** 10.35975/apic.v28i2.2419

Received: October 30, 2023; **Reviewed:** December 07, 2023; **Accepted:** December 14, 2023

1. INTRODUCTION

CAD is a complex event in which there is a poor supply of blood and oxygen to the heart muscle. CAD disease is considered the primary source of morbidity and mortality worldwide.[1]

Metabolic syndrome (MetS) is a group of medical comorbidities that occur together, which increases the likelihood of developing stroke, heart disease, and type 2 diabetes mellitus (T2DM).[2] It is linked with a higher risk of CAD.[3] MetS and its components can be influenced by variable factors, age, genetics, gender, diet, lifestyle, levels of physical exercise, diabetes, hypertension, and others.[4,5]

The criteria used for the diagnosis of MetS are diverse, including WHO criterion,[6] European Group for the Study of Insulin Resistance (EGIR) in 1999,[7]

Table 1: Characteristics of the study groups.

Parameters	Males			Females		
	Patients (n = 93)	Controls (n = 93)	P-value*	Patients (n = 57)	Controls (n = 57)	P-value#
Age (y)	56.4 ± 8.5	57.9 ± 12	P > 0.05	58.4 ± 13.9	55.6 ± 9	P > 0.05
SBP (mmHg)	139.2 ± 22.0	120.0 ± 14.6	P < 0.01	138.0 ± 25.5	113.2 ± 15.7	P < 0.01
DBP (mmHg)	86.3 ± 14.0	76.5 ± 6.2	P < 0.01	86.5 ± 12.0	74.8 ± 5.8	P < 0.01
WC (cm)	103.0 ± 13.0	76.5 ± 6.2	P < 0.01	97.9 ± 15.84	81.4 ± 6.3	P < 0.01
BMI (kg/m2)	26.4 ± 4.9	21.0 ± 3.6	P < 0.01	28.7 ± 4.7	23.2 ± 3.3	P < 0.01

*Data presented as Mean ± SD; WC: Waist circumference, *: P- value (male patients vs. male controls), #: P- value (female patients vs. female controls)*

International Diabetes Foundation (IDF) 2005 criterion,[8] American Heart Association/National Heart, Lung and Blood Institute AHA/NHLBI,[9] American Association of Clinical Endocrinologists (AACE),[10] and Adult Treatment Panel III (ATPIII) 2001 criteria.[6]

According to updated ATPIII criterion, MetS is defined by presence of 3 or more of the following: Waist circumference (WC) ≥ 88 cm for women and ≥ 102 cm for men, low HDL-C (< 40 mg/dL in men, < 50 mg/dL in women), elevated triglyceride (TG) (≥ 150 mg/dL), hypertension (BP more than 130/85 mmHg), and IFG (≥ 100 mg/dL).6,11 A great connection has been found between MetS and CAD events, several studies showed a correlation between MetS and carotid atherosclerosis.[12]

The purpose of this study was to determine the frequency of MetS and its components among patients with CAD, in Basrah, Iraq.

2. METHODOLOGY

This case-control study proceeded in Basra Oil Specialized Hospital for Cardiovascular Medicine and Surgery, in Basrah governorate, Southern Iraq, from December 2022 to April 2023.

We enrolled 300 participants in this study, out of which 150 were patients (93 males, 57 females) scheduled for percutaneous coronary intervention (PCI), and 150 participants (93 males, 57 females) were apparently healthy as a control, matched for age and gender with patients. All subjects in the study underwent body weight, height measurements; waist circumference, BMI, and BP were measured, BP was taken twice after at least 10 min between two measurements. Blood samples were collected for all subjects, fasting plasma glucose (FPG) levels were determined and reference enzymatic methods carried out.

Patients were diagnosed with MetS according to the updated ATPIII criteria, the diagnosis of MetS require the presence of three or more of the following: WC ≥ 88 for women and ≥ 102 for men; low HDL-C (< 40 mg/dL in men, < 50 mg/dL in women); elevated TG (≥ 150 mg/dL); hypertension (≥ 130/85 mmHg), and impaired fasting glucose (IFG) (≥ 100 mg/dL) (Table 2).[6,10]

The statistical package for social sciences (IBM SPSS) software version 25.0, IBM Corp., Chicago, USA, 2021, was used to analyze the data of this study. P < 0.05 was considered to be significant.

3. RESULTS

The characteristics of the study groups, including age, SBP, DBP, WC and BMI are listed in Table 1. Which reveal no significant differences between patients with CAD (whether they were males or females) and controls in term of age (P > 0.05). On the other hand, SBP, DBP, WC, and BMI were significantly higher among patients

Table 2: Frequency of metabolic syndrome

MetS Presence	Males			Females			Overall		
	Patients n (%)	Controls n (%)	P - value*	Patients n (%)	Controls n (%)	P - value#	Patients n (%)	Controls n (%)	P - value@
Present	68 (73)	17 (18)	< 0.01	50 (88)	10 (17.5)	< 0.01	118 (78.7)	27 (18)	< 0.01
Absent	25 (27)	76 (82)		7 (12)	47 (82.5)		32 (21.3)	123 (82)	
Total	93 (100)	93 (100)		57 (100)	57 (100)		150 (100)	150 (100)	

**: P- value (male patients vs. male controls), #: P- value (female patients vs. female controls), @: P- value (overall patients vs. overall controls).*

Table 3. Frequency of Metabolic Syndrome components

MetS Component	Males			Females			Overall		
	Patients n (%)	Controls n (%)	P *	Controls n (%)	Patients n (%)	P #	Controls n (%)	Patients n (%)	P @
WC (cm)	39 (42)	21 (22.5)	< 0.01	41 (72)	10 (17.5)	< 0.01	80 (53)	31 (21)	< 0.01
FPG (mg/dL)	49 (53)	0.0 (0.0)	< 0.01	38 (66.6)	0.0 (0.0)	< 0.01	87 (58)	0.0 (0.0)	< 0.01
BP (mg/dL)	69 (74)	17 (18)	< 0.01	43 (75)	10 (17.5)	< 0.01	112 (75)	27 (18)	< 0.01
HDL-C (mg/dL)	75 (80.6)	28 (30)	< 0.01	43 (75)	34 (60)	< 0.01	118 (79)	62 (41)	< 0.01
TG (mg/dL)	75 (80.6)	17 (18)	< 0.01	48 (82)	2 (3.5)	< 0.01	123 (82)	19 (13)	< 0.01

*WC: Waist circumference, FPG: Fasting plasma glucose, BP: Blood pressure, HDL-C: High density lipoprotein-Cholesterol, TG: Triglycerides, * P - male patients vs. male controls*
 # P - female patients vs. female controls; @ P - overall patients vs. overall controls.

(in both males and females) in comparison to controls (P < 0.01).

Comparative frequency of metabolic syndrome in patient s as well as control groups are given in Table 2.

The frequencies of the components of MetS; e.g., WC, FPG, BP, HDL-C, and TG, among patients were significantly higher than the controls (P < 0.01) as shown in Table 3.

4. DISCUSSION

Several studies were conducted in Basrah on various aspects of MetS and the diverse clinical conditions associated with MetS.[13–16] The prevalence of MetS in patients with CAD can be affected by various factors, for example: age, gender, and the specific diagnostic criteria used. However, it is clear that MetS is a crucial risk factor for CAD and is linked with bad prognosis in those patients.[3,17]

Overall, the frequency of MetS among patients with CAD, which is high in comparison to controls, can be attributed to the clustering of multiple cardiometabolic risk factors, including insulin resistance, subclinical inflammation, and individual components such as elevated glucose, abdominal obesity, and elevated blood pressure.[18] These factors contribute to the emergence and progression of CAD and are related to a superior risk of cerebrovascular events in the future as well as mortality.[19]

Regarding this current study, the frequency of MetS among overall patients (78.7%) was significantly higher than the controls (18%), (P < 0.01).

The incidence of MetS in this study was registered to be higher in females (88%) than in the males (73%), and this finding may suggest that MetS in disease or disorder, occurs more frequently in females, and leads to several clinical consequences such as T2DM and CAD.

Concerning African American, South Asian, and Mexican American populations, the incidence was more frequent among females than males.[20,21] Another study found that changes in MetS and its components were connected with a variety of risks for CVD events in both genders, with generally prominent association in women than men.[22]

5. CONCLUSION

In conclusion, the frequency of metabolic syndrome is significantly higher among patients with coronary artery disease (whether males or females) in comparison to controls. This indicates that patients with metabolic syndrome are at considerable risk of cerebrovascular events.

6. Data availability

The datasets produced and/or analyzed during the current study are available from the corresponding author on a reasonable request

7. Ethical issues

This study was approved by the institutional research ethics committee of the Department of Biochemistry, College of Medicine, University of Basrah, Basrah, Iraq Written informed consent was obtained from all patients.

8. Conflict of interest

The study utilized the hospital resources only, and no external or industry funding was involved.

9. Authors' contribution

MAH: Drafting the manuscript

SKA, MAHZ: Conduction of the study work, manuscript editing

MMMA: Evaluation and sending the manuscript

10. REFERENCES

1. Dalen JE, Alpert JS, Goldberg RJ, Weinstein RS. The epidemic of the 20th century: coronary heart disease. Am J Med. 2014;127(9):807–12. PMID: 24811552; DOI: 10.1016/j.amjmed.2014.04.015
2. Samson SL, Garber AJ. Metabolic syndrome. Endocrinol Metab Clin. 2014;43(1):1–23. PMID: 24582089; DOI: 10.1016/j.ecl.2013.09.009
3. Alshammary AF, Alharbi KK, Alshehri NJ, Vennu V, Ali Khan I. Metabolic syndrome and coronary artery disease risk: a meta-analysis of observational studies. Int J Environ Res Public Health. 2021;18(4):1773. PMID: 33670349; PMCID: PMC7918238;
4. Jamal A, Phillips E, Gentzke AS, Homa DM, Babb SD, King BA, et al. Current cigarette smoking among adults—United States, 2016. Morb Mortal Wkly Rep. 2018;67(2):53. PMID: 29346338; PMCID: PMC5772802; DOI: 10.15585/mmwr.mm6702a1
5. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Investigators IS. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet. 2004;364(9438):937–52. PMID: 15364185; DOI: 10.1016/S0140-6736(04)17018-9
6. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, And Treatment of High Blood Cholesterol In Adults (Adult Treatment Panel III). JAMA. 2001 May 16;285(19):2486-97.. PMID: 11368702; DOI: 10.1001/jama.285.19.2486
7. Balkau B, Charles MA.. Comment on the provisional report from the WHO consultation. European Group for the Study of Insulin Resistance (EGIR). Diabet Med. 1999;16:442–3. PMID: 10342346; DOI: 10.1046/j.1464-5491.1999.00059.x
8. Zimmet P, Alberti KGMM, Ríos MS. A new International Diabetes Federation (IDF) worldwide definition of the metabolic syndrome: the rationale and the results. Vol. 58, Revista Española de Cardiología (English Edition). Elsevier Doyma; 2005. p. 1371–5. PMID: 16371194; [Free article]
9. Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, et al. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute scientific statement: Executive Summary. Crit Pathw Cardiol. 2005 Dec;4(4):198-203. PMID: 18340209; DOI: 10.1097/00132577-200512000-00018
10. Einhorn D, Reaven GM, Cobin RH, Ford E, Ganda OP, Handelsman Y, et al. American College of Endocrinology position statement on the insulin resistance syndrome. Endocr Pract. 2003 May-Jun;9(3):237-52. PMID: 12924350
11. Huang PL. A comprehensive definition for metabolic syndrome. Dis Model Mech. 2009;2(5–6):231–7. PMID: 19407331; PMCID: PMC2675814; DOI: 10.1242/dmm.001180
12. Antonini-Canterin F, La Carrubba S, Gullace G, Zito C, Di Bello V, Di Salvo G, et al. Association between carotid atherosclerosis and metabolic syndrome: results from the ISMIR study. Angiology. 2010;61(5):443–8. PMID: 20304865; DOI: 10.1177/0003319709360523
13. Mansour AA, Al-Maliky AA, Kasem B, Jabar A, Mosbeh KA. Prevalence of diagnosed and undiagnosed diabetes mellitus in adults aged 19 years and older in Basrah, Iraq. Diabetes Metab Syndr Obes. 2014 May 2;7:139-44. PMID: 24833912; PMCID: PMC4014373; DOI: 10.2147/DMSO.S59652
14. Mansour AA, Al-Hassan AA, Al-Jazairi MI. Cut-off values for waist circumference in rural Iraqi adults for the diagnosis of metabolic syndrome. Rural Remote Health. 2007;7(4):1–6. PMID: 18069907;
15. Ali Mansour A. METABOLIC SYNDROME AMONG ADULTS POPULATION SINGLE CENTER EXPERANCE IN BASRAH. Med J Basrah Univ. 2005;23(1):38–41. DOI: 10.33762/MJBU.2005.47319
16. Yousif HY, Ajlan SK. Insulin Resistance and Residual ß-Cell Function Among Persons with Impaired Fasting Glycaemia. AMJ 2022;62(07):3255-3265 . [Free article]
17. Mahalle N, Garg M, Naik S, Kulkarni M. Association of metabolic syndrome with severity of coronary artery disease. Indian J Endocrinol Metab. 2014;18(5):708. PMID: 25285291; PMCID: PMC4171897; DOI: 10.4103/2230-8210.139238
18. Barden AE, Huang R-C, Beilin LJ, Rauschert S, Tsai I-J, Oddy WH, et al. Identifying young adults at high risk of cardiometabolic disease using cluster analysis and the Framingham 30-yr risk score. Nutr Metab Cardiovasc Dis. 2022;32(2):429–35. PMID: 34895997; DOI: 10.1016/j.numecd.2021.10.006
19. Oğuz A, Kilickap M, GÜLEÇ H, Altuntas Y, Karsidag K, Temizhan A, et al. Risk of cardiovascular events in patients with metabolic syndrome: Results of a population-based prospective cohort study (PURE Turkey). Anatol J Cardiol. 2020 Sep;24(3):192-200. PMID: 32870166; PMCID: PMC7585972; DOI: 10.14744/AnatolJCardiol.2020.27227
20. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey. JAMA. 2002;287(3):356–9. PMID: 11790215; DOI: 10.1001/jama.287.3.356 [Full article]
21. Park Y-W, 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(4):427–36. PMID: 12588201; PMCID: PMC3146257; DOI: 10.1001/archinte.163.4.427

22. Ramezankhani A, Azizi F, Hadaegh F. Gender differences in changes in metabolic syndrome status and its components and risk of cardiovascular disease: a longitudinal cohort study. Cardiovasc Diabetol. 2022;21(1):227. PMID: 36324143; PMCID: PMC9632145; DOI: 10.1186/s12933-022-01665-8

