Journal of Pharmaceutical Research International

33(16): 31-36, 2021; Article no.JPRI.66276
ISSN: 2456-9119
(Past name: British Journal of Pharmaceutical Research, Past ISSN: 2231-2919, NLM ID: 101631759)

Metabolic Syndrome among Adults in Saudi Arabia: Prevalence and Predictors

Zayed M. Altowerqi[1,2*] and Zainal Abidin Bin Zainuddin[2]

[1]Physical Education Department, Umm Al-Qura University, Makkah, Saudi Arabia.
[2]Faculty of Social Sciences and Humanities, School of Education, University Technology Malaysia, Johor Bahru, Malaysia.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i1631293
Editor(s):
(1) Dr. Q. Ping Dou, Barbara Ann Karmanos Cancer Institute, Wayne State University, USA.
Reviewers:
(1) Krishna Kumar G, Jipmer, India.
(2) Mohammad J. Al-Jassani, Al-Karkh University of Science, Iraq.
Complete Peer review History: http://www.sdiarticle4.com/review-history/66276

Original Research Article

Received 02 January 2021
Accepted 07 March 2021
Published 24 March 2021

ABSTRACT

The prevalence of metabolic syndrome is an emerging health problem and has increased globally. This research aims to determine the prevalence of metabolic syndrome (MS) among Saudi Arabia adults and identify the associated predictors of MS among Saudi Arabia adults. One hundred and one (101) male adults aged between 26 and 60 participated in this study. The researchers collected data on height and weight as well as blood samples. The prevalence of metabolic syndrome was 56.4%. Of the sample, 73.3% ate fast food, 30.7% were smokers, 41.6% were overweight, and 36.6% were obese. It was also found that only 35.6% of participants engaged in low levels of physical activity, 29.7% had a waist size ≥ 102, 70.3% had fasting blood glucose ≥ 100 mg/dl, 48.5% had blood pressure ≥ 130/85 mmHg, 20.8% had triglycerides ≥ 150 mg/dl, 94.1% had high density lipoprotein < 40 mg/dl. Adhoc intervention programmes for non-communicable diseases should be set up in Saudi Arabia to decrease the prevalence of MS.

Keywords: Metabolic syndrome; obesity; physical activity; Saudi Arabia.

**Corresponding author: E-mail: zizotaif@hotmail.com;*

1. INTRODUCTION

In Saudi Arabia metabolic syndrome (MS) is an emerging health issue [1–5]. It is a combination of visceral obesity, high fasting blood glucose, high blood pressure, high triglycerides, and low high-density lipoprotein which predisposes people to increase the risk for type 2 diabetes (T2D) and cardiovascular disease (CVD) [5]. It has complex pathogenesis involving genetic factors, obesity, and sedentary lifestyle [5].

The prevalence of non-communicable diseases is rapidly increasing. According to the World Health Organisation (WHO), it is expected that by 2020 non-communicable diseases will account for 80% of the worldwide burden of disease, causing seven out of ten deaths in developing countries, and 50% of the early deaths (affecting those under 70 years of age) [5,6].

Several studies have reported a high prevalence of MS in Saudi Arabia and other countries and it is increasing with the adoption of a modern lifestyle. The number of people with MS also differs by ethnicity and gender, which subsequently affects individuals' morbidity and mortality [5,7].

To the best of our knowledge, there is a paucity of research on the prevalence of MS in Saudi Arabia. Moreover, no recent studies have highlighted the risk factors that could affect the persistence or disappearance of MS. Knowing the factors that predict the persistence of MS and its associated factors will provide an opportunity for interventions aiming to reduce CVD and T2D. Therefore, this research aims to determine the prevalence of MS among Saudi Arabia adults and identify the associated predictors of MS among Saudi Arabia adults.

2. METHODOLOGY

Details on the design, sampling protocol and data collection are presented in another study we have published [8]. In brief, 101 male adults aged between 26 and 60 participated in this study. The researchers collected data on height and weight as well as blood samples. The blood sample was obtained in line with WHO guidelines on drawing blood [9,5]. Data on physical activity levels, dietary behaviours and smoking status were collected using electronic questionnaire methods. The International Physical Activity Questionnaire was used to collect data of physical activity levels. Answers yes or no were used to obtain data regarding fast food and smoking. All Data were collected over a three-months period (October-November 2020).

We defined MS using the Third Report of the National Cholesterol Education Program (NCEP) Expert's Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). The current ATP III criteria describes MS when there are any three of the following characteristics: ‘visceral obesity, defined as a waist size >88 cm in women and >102 cm in men; fasting blood glucose ≥100 mg/dL; serum triglycerides ≥150 mg/dL; serum High-density lipoprotein (HDL) cholesterol <40 mg/dL in men and <50 mg/dL in women; and hypertension ≥130/85 mm Hg’(5).

3. STATISTICAL ANALYSIS

Continuous data are reported as mean ± standard deviation and categorical variables as frequencies and numbers (percentage). A logistic regression test was used to determine the predictor's factors that increases the prevalence of metabolic syndrome. Statistical analysis was performed using SPSS software version 23. The p-values <0.05 were considered to be statistically significant.

4. RESULTS

Data were obtained for physiological and health measurements and survey responses. The study participants consisted of 101 individuals who had volunteered to participate in this study. The mean age of study participants was 41.87 years (SD = 7.89) and ranged from 28 to 60. Most (73.3%) of participants ate fast food, and 30.7% were smokers. The prevalence of MS was found to be 56.44% (Fig.1). Among the total participants, 41.6% were overweight, 36.6% were obese, and 35.6% of participants engaged in low levels of physical activity.

Regarding waist size, 29.7% had a waist size ≥ 102. Among total participants, 70.3% had to fast blood glucose ≥ 100 mg/dL. The study results indicated that 48.5% of participants had blood pressure ≥ 130/85 mmHg, 20.8% had triglycerides ≥ 150 mg/dL, and 94.1% had high-density lipoprotein < 40 mg/dL.

According to the study, MS prevalence increased with age, increased with high body mass index, increased with eating fast food, and was less among people who engage in moderate to high levels of physical activity.

Table 1. Various predictors of metabolic syndrome among study participants

Variables							95% C.I. For Odds Ratio	
	B	SE.	Wald	df	P	Odds Ratio	Lower	Upper
Age	-.071	.035	4.245	1	.039	.931	.870	.997
Body mass index	-.260	.067	15.217	1	.000	.771	.677	.879
Fast foods (1)	-1.180	.576	4.190	1	.041	.307	.099	.951
Physical activity levels (METs)	.000	.000	4.469	1	.035	1.000	1.000	1.001

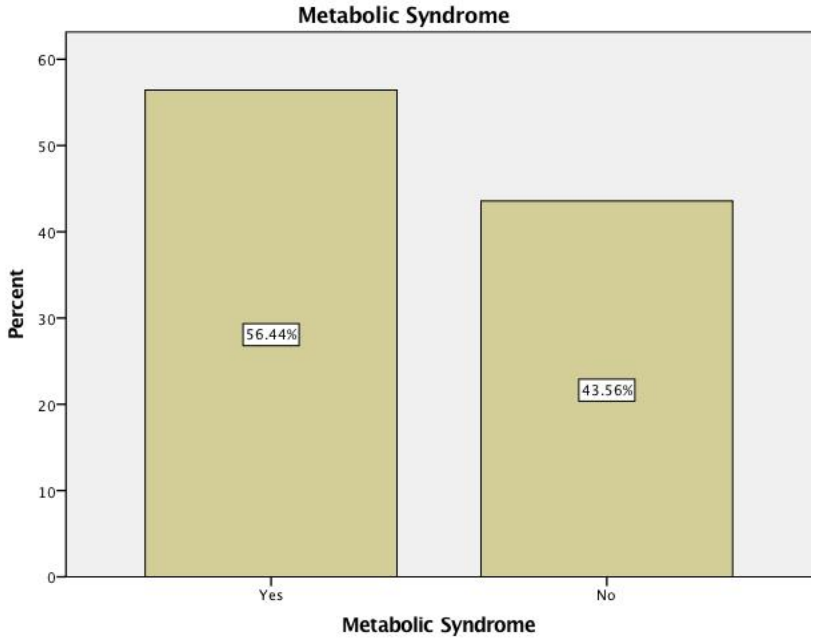

Fig. 1. Prevalence of MS. among study participants

5. DISCUSSION

There is a dearth of available data regarding the prevalence of MS in Saudi Arabia. This research aims to determine the prevalence of MS among adults in Saudi Arabia and identify the associated predictors of MS among adults in Saudi Arabia.

Internationally, the prevalence of MS is increasing, and developing countries such as Saudi Arabia are not exempt from this. It has been reported that MS increase the risk of CV two-fold and the risk of T2D three to five-fold compared to people without MS [7]. According to the finding of the current study, the prevalence of MS is high. The prevalence of MS in the current study was estimated using the ATP III criteria, the prevalence of MS in former athletes was 38.61% and in non-athletes was 17.82%. Therefore, identifying the risk factors and variables that predict MS is necessary to identify people who may benefit from early interventions.

Some believed that the increasing prevalence of MS occurs just with increasing age. However, it is crucial to be aware of the other risk factors for MS, such as sedentary lifestyles and unhealthy food. For instance, the current diets consumed by people in KSA need close monitoring, as it is thought to fuel the prevalence of MS [10–13]. It has been shown that high-fat and high-sugar diets influences the blood biochemical profile of the people involved, thereby subjecting them to a higher risk of MS [10–13].

However, several studies have shown that physical inactivity, high BMI, eating fast foods, and UA play a significant role in increasing the prevalence of MS [10,11,13–18]. In European and Asian countries, for example, it has been reported that BMI is an accurate predictor of MS for people who are 50 and above and it has been associated with T2D [15,16].

According to the study's results, BMI, PA, age, and fast food are the factors which significantly affect the prevalence of MS. The study findings are consistent with previous studies that have shown that BMI, age, PA, and unhealthy diets increase the likelihood of MS [10,11,14,15]. The logistic regression test showed that PA was inversely associated with the prevalence of MS. According to the study's results, all those variables are independent predictors of MS. However, the study's result showed no significant effect of UA in the occurrence of MS, which is inconsistent with early studies, which reported that UA could be used as a predictor of the development MS [17,18].

The robust finding of this study is that higher BMI can predict the development of MS, confirming

the previous study which indicates that using BMI is an accurate predictor of MS [14,16]. Carnethon et al. [16] stated that high BMI is a significant, easily observed, and measurable risk factor for MS. They reported that BMI remained a strong significant predictor of MS, and higher BMI is associated with high BP, high FBG, and high blood lipids, which are the remaining risk factors of MS.

The study result is consistent with studies of MS and unhealthy diets (10–13). According to Bahadoran et al. [12], the risk of MS and some of the risk factors of MS such as visceral fat and high blood lipids increase for people who have diets with high energy. Moreover, they suggest that fast food can be an independent predictor of high BMI, high FBG, and MS [12].

6. CONCLUSION

Our study is one of the few studies that determine the prevalence of MS among adults in Saudi Arabia and identify the associated predictors of MS among adults in Saudi Arabia. MS prevalence was 56.44%. We found that high BMI, age, PA, high consumption of fast food had a significant effect on the prevalence of MS. Our study is in line with the Saudi Arabia Government Vision 2030 and the 2020 National Transformation Plan, it will help health care stockholders and the Saudi Arabia government decreases the percentage of MS in our population. Our study will therefore allow a clearer view of the health status of people in Saudi Arabia. This study's findings will assist in health promotions and the development of strategies for prevention and control of the risk factors for CVD. Future research can be carried out on an expressive number of participants including females to investigate the prevalence of MS and identify the associated predictors of MS among adults in Saudi Arabia. In conclusion, this study's findings revealed that high BMI, age, PA, high consumption of fast food have a significant effect on the prevalence of MS.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

The School of Education at University Technology Malaysia (UTM) has approved this study.

ACKNOWLEDGEMENTS

Our sincere thanks to the participants in this study for their collaboration.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Al-Rubeaan K, Bawazeer N, Al Farsi Y, Youssef AM, Al-Yahya AA, AlQumaidi H, et al. Prevalence of metabolic syndrome in Saudi Arabia - A cross sectional study. BMC Endocr Disord. 2018;18(1):1–9.
2. Bahathiq AO, Elawad BE. Prevalence of metabolic syndrome among female school children in Saudi Arabia : An anthropometric study. Glob J Med Med Sci. 2017;5(4):159–69.
3. Mansour MAAl, Abdalla SM, Mohamed EY, Mahmoud WS, Alzahrani MK, Medani KE. Prevalence and risk factors of metabolic syndrome (MetS) in primary health care centers ' Attendants in Majmaah , Saudi Arabia; 2016.
4. Abogazalah FN, Alreshidi FS. The prevalence of metabolic syndrome among chronic disease patients in Alwazarat health center at Prince Sultan Military Medical City, Riyadh, Saudi Arabia; 2014. Int J Med Sci Public Heal. 2016;5(01).
5. Altowerqi ZM, Abidin Z, Zainuddin BIN, Ahmed HS. Prevalence of metabolic syndrome among former athletes. Int J Mech Prod Eng Res Dev. 2020;10(3): 7135–40.
6. Islam SMS, Purnat TD, Phuong NTA, Mwingira U, Schacht K, Fröschl G. Non Communicable diseases (NCDs) in developing countries: A symposium report. Global Health. 2014;10(1).
7. Kaur J. A comprehensive review on metabolic syndrome. Cardiol Res Pract; 2014.
8. Altowerqi ZM, Zainuddin ZA Bin. Comparison of metabolic syndrome, uric acid and leisure time physical activity between former athletes and non-athlees. J Pharm Res Int. 2021;32(48):85–95.
9. WHO. WHO guidelines on drawing blood : Best practices in Phlebotomy; 2010.
10. Palaniappan L, Carnethon M, Wang Y, Hanley A, Fortmann S, Haffner S, et al. Predictors of the Incident Metabolic

Syndrome in Adults. Diabetes Care. 2004; 27(3):788–93.

11. Asghari G, Yuzbashian E, Mirmiran P, Mahmoodi B, Azizi F. Fast food intake increases the incidence of metabolic syndrome in children and adolescents: Tehran lipid and glucose study. PLoS One [Internet]. 2015;10(10):1–11. Available:http://dx.doi.org/10.1371/journal.pone.0139641
12. Bahadoran Z, Mirmiran P, Hosseini-Esfahani F, Azizi F. Fast food consumption and the risk of metabolic syndrome after 3-years of follow-up: Tehran Lipid and Glucose Study. Eur J Clin Nutr. 2013;67 (12):1303–9.
13. Rodríguez-Monforte M, Sánchez E, Barrio F, Costa B, Flores-Mateo G. Metabolic syndrome and dietary patterns: a systematic review and meta-analysis of observational studies. Eur J Nutr. 2017; 56(3):925–47.
14. Oliveira CCDe, Dias E, Karla A, Roriz C, Ramos LB. Predictors of Metabolic Syndrome in the Elderly: A Review Carolina. 2017;30(4):343–53.
15. Omuse G, Maina D, Hoffman M, Mwangi J, Wambua C, Kagotho E, et al. Metabolic syndrome and its predictors in an urban population in Kenya: A cross sectional study. BMC Endocr Disord. 2017;17(1):1–11.
16. Carnethon MR, Loria CM, Hill JO, Sidney S, Savage PJ, Liu K. Risk factors for the metabolic syndrome in contemporary China. Diabetes Care. 2004;27:2707–15.
17. Cicero AFG, Fogacci F, Giovannini M, Grandi E, Rosticci M, D'Addato S, et al. Serum uric acid predicts incident metabolic syndrome in the elderly in an analysis of the Brisighella Heart Study. Sci Rep. 2018; 8(1):4–9.
18. Jaipakdee J, Jiamjarasrangsri W, Lohsoonthorn V, Lertmaharit S, Medicine S. Prevalence of metabolic syndrome and its association with serum uric acid levels in Bangkok Thailand. Southeast Asian J Trop Med Public Heal. 2013;44(3).

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/66276