Original Article

Association between metabolic syndrome and subjective social status in coronary artery disease patients, a cross sectional study

Tolou Hasandokht [1], Hossein-Ali Nikbakht [2], Arsalan Salari [*1], Soheil Soltanipour [3], Behrang Motamed [4], Jalal Kheirkhah [1]

[1] Cardiovascular Diseases Research Center, Department of Cardiology, Heshmat Hospital, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran.
[2] Social Determinants of Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran.
[3] Department of Community Medicine, GI Cancer Screening and Prevention Research Center, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran.
[4] Department of internal medicine, Razi Hospital, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran.

Corresponding author and reprints: Arsalan salari, Professor of Interventional Cardiology, Cardiovascular Diseases Research Center, Department of Cardiology, Heshmat Hospital, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran.

Email: gums.icrc@gmail.com

Received: 6 Nov 2021 **Accepted:** 9 Jun 2022 **Published:** 02 Mar 2023

Abstract

Background: The goal of the current study was to assess the relationship of metabolic syndrome (MetS) with subjective social status (SSS) and depression symptoms among coronary artery disease patients (CAD).

Methods: This is a cross-sectional study; data were gathered from patients who want to participate in the study through a simple sampling method from December 2019 to December 2020. Inclusion criteria were all patients aged 30 and over with any documents showing CAD from a university referral hospital in Rasht, Iran. SSS and depression were assessed using the MacArthur scale and beck depression scale, respectively. Study analysis has been done with descriptive analysis and logistic regression.

Results: Data related to 500 CAD patients with a mean age of 61.81 (SD=12.25) were assessed. MetS was observed in 57 % of the study population. Almost 75% of the population were in the lower SSS category (rung≤6). we find no significant association between MetS and SSS (OR=0.79, 95% CI=0.53-1.19, P=0.274). The odds of MetS was more in women compared to men [OR=1.67, 95% CI=1.16-2.42, p=0.006] as well as in nonsmoker rather than smoker (OR= 0.61, 95% CI=0.41-0.91, p=0.018). There was no statistically significant association between depression and the odds of MetS (OR=0.98, P=0.950). After adjustment, we didn't detect any statistically significant association between SSS and MetS (OR=0.74, 95% CI=0.49-1.12, P=0.163).

Conclusion: Although the present study failed to show the association between subjective social status and MetS, more researches need to examine the consequence of perceived social standing on the cardiometabolic risk factors.

Keywords: coronary artery disease; metabolic syndrome; social class; social status.

Cite this article as: Hasandokht T, Nikbakht H.A, Salari A, Soltanipour S, Motamed B, Kheirkhah J. Association between Metabolic syndrome and Subjective social status in coronary artery disease patients, a cross sectional study. *Soc Determinants Health*. 2023;9 (1):1-9. DOI: http://dx.doi.org/10.22037/sdh.v9i1.36655

Introduction

Metabolic syndrome is a combination of components like hypertension (HTN), glucose intolerance, central obesity, and dyslipidemia related to developing diabetes (DM), cardiovascular disease (CVD), and

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

cancers (1). According to International Diabetes Federation (IDF) (2) and Adult Treatment Panel (ATPIII) (3).

Metabolic syndrome prevalence in IRAN among the general population aged 40-70 years is estimated at 37% and 33.82%, respectively (4). People with MetS presented a two times elevated risk of first CVD event and five times increased risk of future DM (5, 6). combination of genetics, metabolic and ecological factors like physical inactivity, education level, diet, occupation and income have a vital consequence on inflammatory status such as metabolic syndrome (7). The Whitehall study, conducted among British male civil servants, showed an inverse relationship between mortality and socioeconomic status (SES) (6). Kivim¨aki M Et al studied childhood characteristics that showed the metabolic syndrome was associated with lower SES (8). A substantial number of the literature showed social deprivation is related to higher morbidity and health issues (1, 9, 10). Usually, SES has been measured by objective factors such as education level, income, occupation, wealth and consumption with several limitations and weaknesses (11). Despite the necessity of assessing SES in medical study, we didn't find any precise definition about SES. So, the subject of subjective social status (SSS) was known in the epidemiological study (12). SSS is how people observe their place in the community hierarchy in comparison to others (13). SSS was presented a simple tool and based on just one question that can assess multi aspects of an individual's SES (14). Although, there are correlations between SSS and objective SES, but SSS sounds to show a broader range of social factors compared to each indicator of objective SES (15). Furthermore, a study related to World mental health survey showed SSS was associated with several mental disorders (16). a recent study reported an association between SSS and depressive symptoms (17). Baigi et al (11)in 2016 showed a substantial connotation of subjective SS with several medical outcomes particularly CVDs and also it related to the wealth index as an objective indicator of SES among the 1995 Iranian population. Also, a recent systematic review indicated lower SSS is related to a greater risk of CVD, HTN, as well as DM with every level of income, education or occupation (18). Present study examines the association of metabolic syndrome with SSS and depression symptom in coronary artery disease patients.

Methods

In a cross-sectional hospital-based study, we used data from all CAD admitted patients in a university referral hospital, Rasht Iran. Data were collected from all CAD patients admitted to the hospital who want to participate in the study. the study population were collected through a simple sampling method considering inclusion criteria during one year from December 2019 to December 2020. Inclusion criteria were all outpatients from the university hospital of Rasht aged 30 and over with any documents showing coronary artery disease like an electrocardiogram, exercise stress test, nuclear stress test, echocardiography and angiogram according to cardiologist's note. A total of 474 were calculated according to data from Stephan B & et al study (OR:0.75, prevalence of MetS:24%, q=1-p (1-0.24), d=0.04, ß=0.20, α=0.05) (19). vice-chancellor for research of Guilan University of medical science approved the study design and informed consent according to the Helsinki declaration (research number: IR.GUMS.REC.1396.345).

Data collection

A research assistant was provided for collecting demographic, clinical factors and the SSS index. Demographic variables were age, sex, location (urban/ rural), occupation (employed/ unemployed), education (literate/ illiterate), marital status (single/ married), and smoking (yes/no). clinical

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

variables including a history of diabetes, hypertension (HTN), Blood pressure (BP), fasting blood sugar (FBS), triglycerides (tgs), high-density lipoprotein (HDL), waist circumference (WC) and depression status. All clinical data were extracted from the physician's medical notes and laboratory reports. BP was measured while participants were seated for 15 minutes resting by a standardized mercury sphygmomanometer from the right hand two times. The higher number was recorded as BP. We measured body weight and height without shoes using a digital Seca scale and stadiometer. Body mass index (BMI) was measured by weight and height. We measured waist circumference in the midpoint between the lowest rib and the umbilicus when patients standing.

Metabolic syndrome

MetS was defined based on ATPIII (4), if patients have three or more of five cardiometabolic risk factors. MetS components are 1) elevated BP (≥ 130 / 85) or previously diagnosed as HTN or taking HTN medications, 2) FBS ≥ 100 mg/dl or formerly known as DM or taking anti-hyperglycemic drugs, 3) low HDL (<40 in women, <50 in men), 4) tgs ≥ 150 mg/dl or taking meidcation, 5) abdominal obesity (WC ≥ 95 in both men and women according to Iranian population (20).

Depression assessment

In this study, depression was examined by 13 items beck scale (BDI-13) (21). Five categories scored (0-3) normal, (4-7) mild, (8-11) mild to moderate, (12-15) moderate and (16-39) severe. The Persian version of the BDI-13 was psychometrically validated by Dadfar et al in 2016 (22). As some subjects were illiterate, BDI-13 were questioned and filled by our research assistant.

Subjective social status (SSS)

SSS was evaluated by a scale designed by MacArthur, a graphic scale that showed a 10-rung ladder. One instruction was used

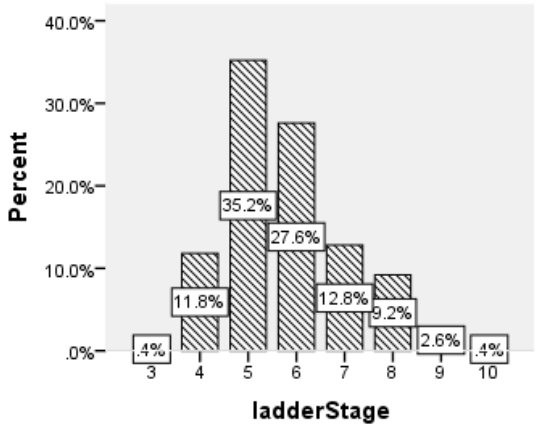

Figure1. Frequency distribution of ladder stage by percentile

for all subjects. “The ladder shows people's position in their society. The highest category of the ladder shows people who have the greatest money and the top job as well as education level. Also, the lowest level, those who have the least money, and low levels of jobs and education. (11)The study subjects were questioned to choose the stair that indicated their position in their community. MacArthur scale was presented in two large studies as a valid and reliable subjective SES indicator in Iranian people (11,23). The mean and median values of the ladder in the present study were 5.81 and 6, respectively (figure1).

We didn’t find any recommended cut point in the previous study. As people in our country often tend to underreport their income, authors decided to consider subjective SES score equal to 6 and lower than 6 as a lower SSS and a score higher than 6 as a high SSS group.

Statistical analysis

Descriptive data were presented as mean (SD) or number (%) according to the type of the variables. Chi-square was used to compare the frequency of metabolic syndrome according to categorical variables. study subjects were classified into two groups according to median score. To examine the connection of metabolic syndrome and SSS and other variables, we used univariate logistic regression analysis. To prevent potential confounding by demographic factors and depression

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

symptoms, the factors with p < 0.25 in univariate analysis were assessed by the multivariable analysis. All analysis was made by Stata version 13 with P < 0.05 as statistical significance.

Results

Overall, 500 CAD subjects aged 61.81 ± 12.25 years (60.77 ± 12.06 for men, 63.37± 12.39 for women, p= 0.020) were entered the study. MetS frequency was 57.00 % (95% CI =52.60 - 61.28).

The mean BMI in the total population was 26.74 ± 4.41 kg/m^2 (26.40 ± 4.18 for men, 27.26 ± 4.70 for women, p=0.033). The frequency of overweight (BMI equal to 25-29.9) and obese group (BMI higher than 30) was 246 (49.2%) and 84 (16.8%), respectively. Also, 189 (37.8%) subjects had DM and 311 (62.2%) had HTN. Near to 60% of study subjects were male, and 342 (68.4%) lived in the city. The average subjective SES score was 5.81 ± 1.27 (figure1). While 375 (75.0%) of participants rated their subjective SES as lower SSS, 125 (25.0%) had rated their SES as high.

As seen in table 1, the most occurrence of metabolic syndrome was reported in patients aged 60-69 years (61.4%). The frequency of MetS in women was 64.5% versus in men 52.0%. Also, MetS was observed in 58.4 % of subjects in lower SSS group comparing to 52.8 % in the higher SSS group. (Table 1).

Based on univariate logistic regression analysis (Table 2), the odds of MetS in patients with higher SSS was 21% lower than subjects with inferior SSS (OR=0.79, 95% CI=0.53-1.19, P=0.274). Although the indirect connection between SSS and metabolic syndrome was observed in multivariate analysis, but this report has no significance (OR= 0.74, 95% CI=0.49-1.12, P=0.163) (table 3).

Table 1 characteristics of study subjects in total and based on having metabolic syndrome

Variable	Subgroup	total	Metabolic Syndrome		p.value
		N=500	yes	no	
		N (%)	285 (57%)	215 (43%)	
Age group (years)	<50	81 (16.2)	43 (53.1)	38 (46.9)	0.26
	50-59	123 (24.6)	71 (57.7)	52 (42.3)	
	60-69	166 (33.2)	102 (61.4)	64 (38.6)	
	70-79	90 (18.0)	52 (57.8)	38 (42.2)	
	80+	40 (8.0)	17 (42.5)	23 (57.5)	
Sex	Male	300 (60.0)	156 (52.0)	144 (48.0)	0.004
	Female	200 (40.0)	129 (64.5)	71 (35.5)	
Living location	Urban	342 (68.4)	188 (55.0)	154 (45.0)	0.1
	Rural	158 (31.6)	97 (61.4)	61 (38.6)	
Marital status	Single	30 (6.0)	14 (46.7)	16 (53.3)	0.16
	Married	470 (94.0)	271 (57.7)	199 (42.3)	
Having Job	no	280 (56.0)	165 (58.9)	115 (41.1)	0.07
	yes	220 (44.0)	120 (54.5)	100 (45.5)	
Having literacy	no	236 (47.2)	140 (59.3)	96 (40.7)	0.18
	yes	264 (52.8)	145 (54.9)	119 (45.1)	
Smoking	no	371 (74.2)	223 (60.1)	148 (39.9)	0.01
	yes	129 (25.8)	62 (48.1)	67 (51.9)	
SSS[a] (ladder rung)	≤6	375 (75.0)	219 (58.4)	156 (41.6)	0.26
	>6	125 (25.0)	66 (52.8)	59 (47.2)	
Depression[b]	no	396 (79.2)	226 (57.1)	170 (42.9)	0.5
	yes	104 (20.8)	59 (56.7)	45 (43.3)	

[a] subjective social status, [b] 13 items beck depression scale

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Table 2. association between metabolic syndrome and subjective social status (SSS), demographic factors and depression symptom using univariate logistic regression

Variable	Subgroup	B (SE)	OR (%95 CI)	p-value[a]
SSS[b] (ladder rung)	≤6		Reference Group	
	>6	-0.22 (0.20)	0.79 (0.53-1.19)	0.274
Depression	no		Reference Group	
	yes	-0.01 (0.22)	0.98 (0.63-1.52)	0.950
Smoking	no		Reference Group	
	yes	-0.48 (0.20)	0.61 (0.41-0.91)	0.018
Age (years)	-	0.002 (0.007)	0.99 (0.98-1.01)	0.935
sex	Male		Reference Group	
	Female	0.51 (0.18)	1.67 (1.16-2.42)	0.006
Living location	Urban		Reference Group	
	Rural	0.26 (0.19)	1.30 (0.88-1.91)	0.178
Marital status	Single		Reference Group	
	Married	0.44 (0.37)	1.55 (0.74-3.26)	0.242
Having job	no		Reference Group	
	yes	-0.17 (0.18)	0.83 (0.58-1.19)	0.326
Having literacy	no		Reference Group	
	yes	-0.18 (0.18)	0.83 (0.58-1.19)	0.322

[a] univariate logistic regression, [b] subjective social status

As table 2 showed, we find a statistically significant connotation between MetS and sex. So that the odds of MetS in women was 67% more than in men (OR= 1.67, 95% CI= 1.16-2.42, p= 0.006). However, in the multivariate study, this finding was slightly weakened (OR=1.49 (0.99-2.24), p=0.054). As observed in table 2, the odds of MetS in smokers was 39% lower than in nonsmokers (p=0.018). But, we didn't find any significant association between MetS and education as well as job. Also, we didn't observe any statistically significant association between MetS and living location (OR= 1.30, p=0.178) and marital status (OR=1.70, p=0.242). (Table 3). However, metabolic syndrome was observed more frequently in an urban area and single subjects.

In the univariate study, we observed no statistically significant connection between depression and the odds of MetS (OR=0.98, 95% CI= 0.63-1.52, P= 0.950).

Discussion

This study describes the relationship between MetS and subjective social status. the present study found that MetS is

Table 3. association between metabolic syndrome and subjective social status (SSS), demographic factors and depression symptoms using multivariate logistic regression

Variable	Subgroup	B (SE)	OR (%95 CI)	p-value[a]
SSS[b] (ladder rung)	≤6		Reference Group	
	>6	-0.29 (0.21)	0.74 (0.49-1.12)	0.163
Smoking	no		Reference Group	
	yes	-0.32 (0.22)	0.72 (0.46-1.13)	0.153
sex	Male		Reference Group	
	Female	0.40 (0.20)	1.49 (0.99-2.24)	0.054
Living location	Urban		Reference Group	
	Rural	0.26 (0.19)	1.30 (0.88-1.93	0.181
Marital status	Single		Reference Group	
	Married	0.53 (0.38)	1.70 (0.80-3.61)	0.167

[a] Multivariate logistic regression, variables with a p-value less than 0.25 in univariate logistic regression were entered into the multivariable model,[b] subjective social status

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

frequent in CAD patients (57%) which was higher than the general population (4). Every component of Metabolic syndrome like DM, HTN, low HDL and obesity is identified as a CVD risk factor, hence we can expect a higher frequency of MetS in CVD patients. In our study, a high number of subjects were in low Subjective social status (rung ≤ 6). This observation was confirmed by the Baigi et al study (11) that showed more than 80 % of the Iranian population were in SSS lower than rung 6. Furthermore, a recent meta-analysis identified the high frequency of low subjective social class in patients with coronary disease (18). Our findings showed the number of MetS was superior in the lower SSS category rather than higher. Although, the finding was not statistically significant, but a systematic review found worse SSS is connected to a higher number of cardiac diseases and every factor of metabolic syndrome including diabetes, dyslipidemia, hypertension, and obesity (18). The result of a study on the 3600 adult population in Iran indicated there is an inverse relationship between obesity and education level in males and females (24). Former studies explained that subjects with inferior SES are more probably choose unhealthy behaviors like tobacco, unhealthy dietary choices and sedentary lifestyle which correlated with MetS (25, 26).

The primary analysis of the present study showed females compared to males are more at risk for metabolic syndrome supported by previous studies indicating obesity and MetS are more prevalent in women (4, 27). However, the reported association didn't remain in multivariate analysis. A recent systematic review of the Iranian population indicated MetS was significantly more common in women (34.8%) compared to men (25.7%) (27). Similar reports were observed in other populations like the United state of America (Native and Mexican American), Turkey, Oman and India (28). Higher frequency of MetS in women can be related to increased abdominal obesity and low HDL as a consequence of physiological changes in hormone serum level after menopause and also unhealthy behaviors (29). Our finding from univariate analysis about reverse connotation among smoking and Mets was detected in some studies that was explained by lower BMI in smokers (30). However, this finding didn't observe in multivariate analysis. The nicotine of cigarette increases the process of lipolysis which lead to reduced HDL as a factor of MetS (31). In our study, the frequency of MetS in rural areas was more than in urban residents. Reports related to a study on the Iranian population indicated that obesity and CVD risk factors increase in Iranian people in both rural and urban areas due to inactivity and unhealthy diet (32). In a study of the Iranian population found there is no difference in high body mass index between rural and urban areas, particularly in women (33). Even though, a study conducted in the north of Iran in 2006 indicated a greater frequency of overweight in rural adolescent girls compared to those living in urban areas (34). Previous studies showed there are higher odds of obesity in individuals with lower SES (35). On the other hand, a study assessed the food insecurity in the rural areas of north of Iran showed individuals with lower income reported higher consumption of bread and cereal group compared to higher income (36). Furthermore, the majority of the rural population were rice farmers so portion of rice in daily diet was substantially high in Guilan province.

Strengths and limitations of the study

The present study involves some limitations:

1) Our study design was cross sectional so we couldn't explain the causality association between SSS and metabolic syndrome.

2) In the present study, from objective indicators of SES (income, job category, education level and wealth index) only having literacy was assessed. Hence we can

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

not compare the score of individuals about their subjective social class with objective SES. However, a recent study suggested SSS had an appropriate correlation with the objective SES indicator (12).
3) Our study population were in-patient CAD patients with newly diagnosed risk factors. Also, the smoking status might have been changed due to cardiac disease. However, our study has some strengths including:
1) we had studied CAD patients from referral cardiovascular hospital which presented a wide range of demographic characteristics.
2) we assessed the relationship between SSS and MetS considering demographic variables.
3) also, in this study depression factor was assessed and primary results were adjusted for depression status. And final point, we didn't enter every component of metabolic syndrome in the statistical analysis due to the existing correlation between these components and MetS.

In conclusion, we observed the superior frequency of MetS among patients with CAD comparing to the Iranian general population. Also, the majority of the study population were in low Subjective social status. Socioeconomic determinants are recommended as a main thing in the management of the disease. further research needs to recognize the underlying factors that influence on the health of the population with lower SES.

Acknowledgment

The authors gratefully acknowledge all participants in the study and all staff of the Cardiovascular Diseases Research Center and the vice-chancellor for research of Guilan University of medical science.

Author's contribution

TH, AS and BM were involved in the study design. HAN and SS involved in data analysis. BM, TH, AS and JKH helped in data collection. JKH, AS and BM contributed to data interpretation. SS and TH helped in searching for literatures. TH, HAN, SS wrote the initial draft of the manuscript. All authors were involved in writing the paper and had final approval of the submission.

Ethical considerations

The informed consent and study design were reviewed and approved by the vice-chancellor for research at Guilan University of medical science according to the Helsinki declaration (research number: IR.GUMS.REC.1396.345).

Funding

This work was supported by the vice-chancellor for research at Guilan University of medical science.

Conflicts of interest

The authors declare that they have no conflict of interest.

References:

1. Hajian-Tilaki K. Metabolic syndrome and its associated risk factors in Iranian adults: A systematic review. Caspian journal of internal medicine. 2015;6 (2):51.

2. Persell SD, Lloyd-Jones DM, Baker DW. Implications of changing national cholesterol education program goals for the treatment and control of hypercholesterolemia. Journal of general internal medicine. 2006;21 (2):171-6.

3. Alberti KGMM, Zimmet P, Shaw J. Metabolic syndrome—a new world-wide definition. A consensus statement from the international diabetes federation. Diabetic medicine. 2006;23 (5):469-80.

4. Nikbakht H-A, Rezaianzadeh A, Seif M, Ghaem H. Prevalence of metabolic syndrome and its components among a population-based study in south of Iran, PERSIAN Kharameh cohort study. Clinical Epidemiology and Global Health. 2020.

5. Jasiukaitienė V, Lukšienė D, Tamošiūnas A, Radišauskas R, Bobak M. The Impact of Metabolic Syndrome and Lifestyle Habits on the Risk of the First Event of Cardiovascular Disease: Results from a Cohort Study in Lithuanian Urban Population. Medicina. 2020;56 (1):18.

6. Puolakka E, Pahkala K, Laitinen TT, Magnussen CG, Hutri-Kähönen N, Tossavainen P, et al. Childhood socioeconomic status in predicting metabolic syndrome and glucose abnormalities in

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

adulthood: the cardiovascular risk in young finns study. Diabetes care. 2016;39 (12):2311-7.

7. Mirmiran P, Asghari G, Farhadnejad H, Alamdari S, Dizavi A, Azizi F. The relationship between occupation transition status and metabolic syndrome in adult women: Tehran lipid and glucose study. Metabolic syndrome and related disorders. 2016;14 (5):265-71.

8. Kivimäki M, Smith GD, Juonala M, Ferrie JE, Keltikangas-Järvinen L, Elovainio M, et al. Socioeconomic position in childhood and adult cardiovascular risk factors, vascular structure, and function: cardiovascular risk in young Finns study. Heart. 2006;92 (4):474-80.

9. Brown AF, Ettner SL, Piette J, Weinberger M, Gregg E, Shapiro MF, et al. Socioeconomic position and health among persons with diabetes mellitus: a conceptual framework and review of the literature. Epidemiologic reviews. 2004;26 (1):63-77.

10. Dinsa GD, Goryakin Y, Fumagalli E, Suhrcke M. Obesity and socioeconomic status in developing countries: a systematic review. Obesity reviews. 2012;13 (11):1067-79.

11. Baigi V, Nedjat S, Fotouhi A, Janani L, Mohammad K. Subjective social status in association with various health and socioeconomic indicators in Tehran. Journal of Public Health. 2016;24 (6):497-503.

12. Adler NE, Epel ES, Castellazzo G, Ickovics JR. Relationship of subjective and objective social status with psychological and physiological functioning: Preliminary data in healthy, White women. Health psychology. 2000;19 (6):586.

13. Hoebel J, Müters S, Kuntz B, Lange C, Lampert T. Measuring subjective social status in health research with a German version of the MacArthur Scale. Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz. 2015;58 (7):749-57.

14. Singh-Manoux A, Marmot MG, Adler NE. Does subjective social status predict health and change in health status better than objective status? Psychosomatic medicine. 2005;67 (6):855-61.

15. Franzini L, Fernandez-Esquer ME. The association of subjective social status and health in low-income Mexican-origin individuals in Texas. Social science & medicine. 2006;63 (3):788-804.

16. Scott KM, Al-Hamzawi AO, Andrade LH, Borges G, Caldas-de-Almeida JM, Fiestas F, et al. Associations between subjective social status and DSM-IV mental disorders: results from the World Mental Health surveys. JAMA psychiatry. 2014;71 (12):1400-8.

17. Hoebel J, Maske UE, Zeeb H, Lampert T. Social inequalities and depressive symptoms in adults: the role of objective and subjective socioeconomic status. PloS one. 2017;12 (1):e0169764.

18. Tang KL, Rashid R, Godley J, Ghali WA. Association between subjective social status and cardiovascular disease and cardiovascular risk factors: a systematic review and meta-analysis. BMJ open. 2016;6 (3):e010137.

19. Manuck SB, Phillips J, Gianaros PJ, Flory JD, Muldoon MF. Subjective socioeconomic status and presence of the metabolic syndrome in midlife community volunteers. Psychosomatic medicine. 2010;72 (1):35.

20. AZIZI F, Khalili D, Aghajani H, ESTEGHAMATI A, Hosseinpanah F, DELAVARI A, et al. Appropriate waist circumference cut-off points among Iranian adults: the first report of the Iranian National Committee of Obesity. 2010.

21. Beck AT, Beck RW. Screening depressed patients in family practice: A rapid technic. Postgraduate medicine. 1972;52 (6):81-5.

22. Dadfar M, Kalibatseva Z. Psychometric Properties of the Persian Version of the Short Beck Depression Inventory with Iranian Psychiatric Outpatients. Scientifica. 2016;2016.

23. Abdollahpour, Ibrahim, Mooijaart, Simon,Aguilar-Palacio, Isabel Salimi, Yahya Nedjat, Saharnaz Mansournia, Mohammad Ali de Courten, Maximilian.Socioeconomic status as the strongest predictor of self-rated health in Iranian population; a population-based cross-sectional study. Journal of psychosomatic research. 2019; 124

24. Hajian-Tilaki K, Heidari B. Association of educational level with risk of obesity and abdominal obesity in Iranian adults. Journal of Public Health. 2010;32 (2):202-9.

25. Nandi A, Glymour MM, Subramanian S. Association among socioeconomic status, health behaviors, and all-cause mortality in the United States. Epidemiology. 2014:170-7.

26. Phillips AC, Carroll D, Thomas GN, Gale CR, Deary I, Batty GD. The influence of multiple indices of socioeconomic disadvantage across the adult life course on the metabolic syndrome: the Vietnam Experience Study. Metabolism. 2010;59 (8):1164-71.

27. Farmanfarma KK, Kaykhaei MA, Adineh HA, Mohammadi M, Dabiri S, Ansari-Moghaddam A. Prevalence of metabolic syndrome in Iran: A meta-analysis of 69 studies. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2019;13 (1):792-9.

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

28.Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. The lancet. 2005;365 (9468):1415-28

29.Pucci G, Alcidi R, Tap L, Battista F, Mattace-Raso F, Schillaci G. Sex-and gender-related prevalence, cardiovascular risk and therapeutic approach in metabolic syndrome: A review of the literature. Pharmacological research. 2017;120:34-42.

30.Zhu S, St-Onge M-P, Heshka S, Heymsfield SB. Lifestyle behaviors associated with lower risk of having the metabolic syndrome. Metabolism. 2004;53 (11):1503-11.

31. Kim BJ, Han JM, Kang JG, Rhee EJ, Kim BS, Kang JH. Relationship of cotinine-verified and self-reported smoking status with metabolic syndrome in 116,094 Korean adults. *J Clin Lipidol.* 2017;11:638–45.e2.

32.Kelishadi R, Alikhani S, Delavari A, Alaedini F, Safaie A, Hojatzadeh E. Obesity and associated lifestyle behaviours in Iran: findings from the first national non-communicable disease risk factor surveillance survey. Public health nutrition. 2008;11 (3):246-51.

33.Maddah M, Sharami SH. Obesity among Iranian old adult women in urban and rural areas in Guilan. International journal of cardiology. 2010;145 (1):44-5.

34.Maddah M. Overweight among rural girls in Iran: A terrifying prospects of cardiometabolic disorders. International journal of cardiology. 2009;132 (3):442-4.

35.Fan JX, Wen M, Li K. Associations between obesity and neighborhood socioeconomic status: Variations by gender and family income status. SSM - Population Health. 2020;10:100529.

36.Heidari KH EE. Assessing bread consumption pattern in Iran. Commercial surveys. 2010;8 (40):2-20.[in persian]

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License