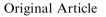Taibah University

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Original Article

Effects of potentially modifiable risk factors on the health of adults in the Eastern Province of KSA

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الملخص

أهداف البحث: تهدف هذه الدراسة للتحقق من العلاقة بين عوامل خطر رئيسة مختارة قابلة للتعديل، تتضمن عادات نمط الحياة، ودخل الأسرة والتدخين على الصحة.

طرق البحث: أجريت هذه الدراسة المستعرضة خلال الفترة من ٢٠١٥-٢٠١٦ على ١٠٤ من الرجال الأصحاء تتراوح أعمارهم بين ٣٨ ± ٨ عاما. جمعت البيانات باستخدام استبانة - تعبأ ذاتيا، تستفسر عن الخصائص السريرية لضغط الدم ومؤشر كتلة الجسم. وتم أخذ عينات من الدم لقياس مستوى سكر الدم الصائم، ومستوى الدهون، والبروتين الدهني عالي الكثافة والدهون الثلاثية.

النتائج: تعد حالة التدخين الحالية واستهلاك مشروبات الطاقة من عوامل الخطر الكبيرة لزيادة ضغط الدم ومستوى السكر دم، على التوالي. لدى المشاركين الذين دخلهم الشهري أكثر من ١٠٠٠٠ ريال سعودي انخفاض في مستوى ضغط الدم الانبساطي مقارنة مع ذوي الدخل الأقل. ولكن، كان هناك انخفاض ملحوظ في وزن الجسم بين مستهلكي الخضروات.

الاستنتاجات: تسلط هذه الدراسة الضوء على تأثير عوامل الخطر الرئيسة القابلة للتعديل على الصحة. وهناك حاجة كبيرة لتحسين وتعزيز نمط الحياة الصحي.

الكلمات المفتاحية: حياة مستقرة؛ عادات؛ مستوى الدهون؛ ضغط الدم؛ التدخين

Abstract

Objectives: The purpose of this study was to investigate the association between selected major modifiable risk factors including life style habits, household income and smoking on health.

Methods: This cross-sectional study was conducted during 2015–2016 among 104 healthy men aged 38 ± 8 years. The data were collected using a self-administered questionnaire that enquired about clinical information about blood pressure and body mass index. Venous blood samples were taken to assess the fasting blood glucose (FBG), lipid profile, high density lipoprotein and triglyceride.

Results: Current smoking status and consumed energy drinks were significantly positive risk factors for increased systolic blood pressure and FBG, respectively. Participants with monthly income of more than 10,000 Saudi Riyals showed significantly lower diastolic pressure than those with lower income. However, there was a significant decrease in body weight among those who consumed vegetables.

Conclusion: This study highlights the effect of major modifiable risk factors on health. There is a great need for improving and enhancing a healthy lifestyle behaviour.

Keywords: Blood pressure; Habits; Lipid profile; Sedentary; Smoking

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Introduction

Human health is influenced by many factors, and cultural and social transitions during the process of economic development are considered to influence the pace of the pathogenesis of many diseases emerging in developing countries.[1] The negative associations between socioeconomic factors and health in such societies have been reported in many studies.[2] For example, socio-demographic characteristics, such as income, schooling, race, obesity, physical inactivity, and smoking, are well-known factors associated with an increase in blood pressure.[3]

With "Westernization" and the increasing predominance of sedentary lifestyles, people from developing countries are engaging in unhealthy behaviours that contribute to the development of obesity.[4,5] For instance, the trend towards increased consumption of artificially sweetened soft drinks, sports drinks, high-energy beverages, and coffee products is observed among adolescents and is linked to the obesity epidemic.[6] The prevalence of obesity is increasing worldwide at an alarming rate in both developing and developed countries, and it has become a serious pandemic health problem. Obesity is a risk factor for many conditions, such as coronary heart disease, metabolic syndrome, type 2 diabetes mellitus, certain cancers, hypertension, and dyslipidaemia,[7–9] and it is estimated to be the fifth leading cause of mortality worldwide.[10]

In KSA, the findings of various studies on the relationship between obesity and lifestyle have not been encouraging. The rapid socioeconomic and cultural revolution that has occurred in KSA since the discovery of oil is associated with a sharp increase in the rate of obesity.[11] Dietary changes have been implicated in the increasing prevalence of both overweightness and obesity among Saudi adults, adolescents and children in the past few decades.[12] Studies have shown increased consumption of refined foods and animal products at the expense of vegetables and fruits among Saudi Arabians during the past few decades.[12] However, limited studies that quantify these behaviours are available.[13] Most related studies are either surveys or retrospective use of self-reporting surveys and do not investigate the relationship between lifestyle behaviours and health risks such as diabetes mellitus and cardiovascular risk factors such as lipid profile, blood glucose parameters, and blood pressure. Thus, the current study aimed to investigate the association between selected major modifiable risk factors, including lifestyle habits and smoking on indicators of metabolic syndrome including body mass index (BMI); arterial blood pressure; and levels of fasting blood glucose (FBG), high-density lipoprotein (HDL), and triglycerides (TG) of men in Eastern Province, KSA.

Materials and Methods

Participant characteristics

This cross-sectional study was conducted between 2015 and 2016. A total of 104 men who had not been diagnosed with any component disease of metabolic syndrome as defined by the International Diabetes Federation (IDF) and without any immobility-causing disorders were recruited to participate in this study. Participants were selected using convenience sampling. The study details were distributed via the noticeboard at Imam Abdulrahman Bin Faisal University, at some Eastern Province community centres, and via the WhatsApp to all members of Saudi Diabetes and Endocrinology Association at the Eastern Province of KSA. The participants were from Imam Abdulrahman Bin Faisal University, two schools at Al-Khobar and Saihat, and some Dammam city centres those who expressed an interest to participate and were eligible to participate signed a written informed consent form, according to the Helsinki Declaration. Further, the study protocol was approved by the Internal Review Board of Imam Abdulrahman Bin Faisal University (IRB No. 2014-14-221).

Study procedure

All participants completed a self-administered questionnaire manually. This questionnaire includes items from previously published tools.[14] Through a pilot study of the questionnaire previously conducted among urban and rural students in KSA, it was found to be valid and reliable.

Subjects' weight was measured using an ordinary scale (portable balance) with indoor clothing on but without shoes. Height was measured to the nearest millimetre with the subjects standing without footwear using a measuring tape that was part of the weighing scale. Subjects were categorized as underweight (BMI, <18 kg/m^2), lean (BMI, $18-25$ kg/m^2), overweight (BMI, $25-30$ kg/m^2), or obese (BMI, >30.0 kg/m^2).[11] With an electronic sphygmomanometer (Omron M6 Comfort [HEM-7223-E]; Omron Healthcare Co., Ltd., Kyoto, Japan), the average of three consecutive blood pressure readings recorded with a 5-min interval was obtained using an appropriately sized cuff as each participant sat with their arms supported at heart level. The cuff was wrapped around the upper arm loosely enough to allow two fingers to be easily placed under it. Systolic and diastolic blood pressures (SBP and DBP, respectively) were recorded digitally, and the values appeared on the screen. At a private laboratory, venous blood samples were drawn from an antecubital vein after the participants fasted overnight for a minimum of 10 h. The laboratory analysed the blood samples to assess the following components of the fasting blood profile: HDL, TG, and plasma glucose.[14]

In this study, quantitative methods were used to investigate the health risk factors. The *t*-test and analysis of variance (ANOVA) were used to analyse differences between lifestyle-related health risk factors. Data were presented as the mean values and standard deviations and analysed using SPSS version 22. Statistical significance was set at the 5% level. Binary logistic regression was used to determine the influence of independent variables on metabolic syndrome.

Results

The baseline characteristics and demographic data of the study participants are presented in Table 1.

The mean age of the 104 participants was 38 ± 8 years and the mean BMI was 29 ± 5 (overweight category). The mean recorded SBP and DBP were 120 ± 12 and 78 ± 8 mmHg, respectively. As shown in Table 2, the mean TG level was 129 ± 22 mg/dl and HDL level was 42 ± 9 mg/dl.

Table 1: Demographic characteristics of participants (n = 104).

Characteristic	Participants	Percent
Marital status		
Single	15	14.4
Married	89	85.6
Job descriptions		
Supervisory manager	12	11.5
Office work	90	86.5
Physical professional	2	1.9
Income (SR)		
5000	9	8.7
5001−10,000	36	34.6
10,001−20,000	59	56.7
Duration of smoking (years)		
Never	70	67.3
1−5	12	11.5
6	22	21.2
Energy drinks consumed/day		
None	90	77.6
≥1	14	22.4
Smoking		
Yes	70	67.3
No	34	32.7
Sleeping (hours/day)		
≤7	45	43.2
7−8	56	53.8
8	3	2.8

Table 4: Dietary habits of the participants.

Frequency per day	Fruits (%)	Vegetables (%)	Energy drinks (%)	Soft drinks (%)
None	1.9	0.0	86.5	26
≤1	26.0	20.2	11.5	40.4
2−3	37.5	37.5	1.0	17.3
4−6	23.1	26.9	1.0	7.7
≥7	11.5	15.4	0.0	8.7

Table 5: Relationship of income and lifestyle factors on health.

Participation's income per month				
Saudi Riyal	5000	5000−10,000	10,000−20,0000[a]	P-value
DP mm/Hg	84.1 ± 7.6	77.4 ± 7.5	76.5 ± 8.7	0.03
Energy drink consumption per day				
Energy Drinks	None	1 or more[a]		P-value
FBG mg/dl	96.5 ± 7.6	105.1 ± 13.1		0.000
Vegetable consumption per day				
Vegetables	1 or less[a]	1−3		P-value
BMI kg/m^2	30.65 ± 6.5	27.56 ± 4.23		0.031
Smoking per year				
Smoking	No	1−5[a]	6−10	P-value
SP mm/Hg	118.2 ± 10.7	130.1 ± 13	114.5 ± 4.6	0.014

[a] Significant difference, DP − diastolic pressure, FBG − fating blood glucose, BMI − body.

Leisure time commitments were divided into three sub-groups, as shown in Table 3. Most study participants (51%) spent 1−3 h of leisure time on the computer. In terms of dietary habits (Table 4), 38% of participants consumed 2−3 fruits and vegetables per day. Interestingly, most participants (87%) did not consume energy drinks, and only 40% consumed ≤1 of soft drinks per day.

The effect of independent variables (lifestyle factors) on metabolic syndrome components showed four significant associations (Table 5). Participants with high income

Table 2: Clinical data.

Characteristic	Mean ± SD
Age (years)	37.0 ± 8
BMI (kg/m^2)	28.8 ± 5
SBP (mmHg)	119.8 ± 12
DSP (mmHg)	77.5 ± 8
TG (mg/dl)	128.7 ± 22
HDL (mg/dl)	41.6 ± 9

Table 3: Leisure time activities of the participants.

Frequency per day	Watching TV (%)	Playing electronic games (%)	Using the computer (%)	Social networking (%)
No leisure time	8.7	87.5	1.9	6.7
Less than 1 h	43.3	8.7	24.0	30.8
1−3 h	39.4	3.8	51.0	29.8
More than 3 h	8.7	0.0	23.1	32.7

(>10,000 SR a month) had significantly lower DBP (76.5 ± 8.7 mm Hg; p = 0.03) than those with medium income (5001−10,000 SR a month; 77.4 ± 7.5 mm Hg) or low income (≤5000 SR a month; 84.1 ± 7.6 mm Hg). SBP differed significantly between individuals who smoked cigarettes for 1−5 years (130.1 ± 13 mm Hg) and non-smokers (118.2 ± 10.7 mm Hg) or individuals who smoked for 6−10 years (114.5 ± 4.6 mm Hg; p = 0.02). Participants who consumed 1 or more vegetables per day had a significantly lower BMI (27.56 ± 4.23 kg/m^2) than those who consumed vegetables less frequently (30.65 ± 6.5 kg/m^2; p = 0.03). Lastly, participants who consumed energy drinks more than once a week had significantly higher FBG levels (105.1 ± 13.1 mg/dL) than those who did not (96.5 ± 7.6 mg/dL; p = 0.001).

Binary logistic regression was used to determine the odd ratios between lifestyle variables and the occurrence of metabolic syndrome. The variables most strongly associated with the occurrence of this disease were medium to high income and frequent snacking. Participants who consumed snacks 1−3 times a day were 1.46 times more likely to have metabolic syndrome, and those who consumed snacks more than 3 times a day were 3.68 times more likely. Further, participants who earned more than 10,000 SR a month were 1.2 times more likely to have metabolic syndrome.

Discussion

The present study was conducted to assess the role of various lifestyle habits on metabolic risk factors. The findings suggest that there are significant relationships between

certain lifestyle behaviours and health risk factors. DBP was elevated in the medium-income group, and high income was associated with the occurrence of metabolic syndrome. Cardiovascular disease is now endemic worldwide and no longer limited to economically developed countries.[14] About a third of all deaths in middle-income countries are caused by cardiovascular disease. Socioeconomic status, mainly when measured by income, can vary greatly with time, and there is evidence that blood pressure is sensitive to fluctuations in this variable.[15] Most of the disease burden caused by high blood pressure is borne by low- and middle-income countries.[16] Blood pressure is also considered a physiological consequence of differential exposure to social, physical, and psychological stressors.[17] Despite this, there is limited information linking contextual socioeconomic status and blood pressure in middle- and low-income countries. A better understanding of the pathways linking economic status to blood pressure and metabolic syndrome is essential for designing interventions to reduce hypertension in rapidly developing countries where the prevalence of hypertension is increasing.[18] The direction and magnitude of relationships are not well understood with respect to income as a contributor to hypertension. It could be that in men with very limited economic prospects and education, high income acts as a buffer against psychosocial stress.[19]

Frequent snacking is associated with the occurrence of metabolic syndrome. Economic changes and cultural habits that lead to sedentary lifestyles are usually associated with snack consumption. Socioeconomic factors may be markers of a diverse range of individual- and community-related factors associated with health risks. Many studies have found relationships between socioeconomic indicators and factors such as dietary patterns, physical activity, and availability of healthy foods. Additionally, multiple elements of communities, such as the social environment, social services, resource allocation, and population heterogeneity, interact to shape health indicators through complex, indirect pathways.[20] Meanwhile, in middle-income developing highly westernized countries, similar factors may explain the socioeconomic factor-associated gradient in blood pressure.[21,22] To curb hypertension, prophylactic and interventional measures are needed, wherein strategies centred on the individual and the community can be combined.[23]

Another important finding of our study was the inverse relationship between total daily vegetable intake and body weight. This finding was in agreement with several other interventional and observational studies, supporting the beneficial role of high dietary fibre intake in preventing weight gain,[24] promoting weight loss,[25] and maintaining a healthy body weight.[26] Findings from different studies support the beneficial role of dietary fibre in body-weight regulation. Pereira et al. proposed physiologic mechanisms by which vegetable consumption helps in weight management.[27] First, fibre-rich foods tend to be more satiating because of their relatively lower energy density and palatability compared to low-fibre foods. Second, dietary fibre, especially soluble fibre, can increase the viscosity of food and slow down digestion, which stimulates the release of gut hormones such as cholecystokinin and glucagon-like peptide 1 and promotes satiety. In addition, dietary fibre could provide a mechanical barrier for the enzymatic digestion of other macronutrients, such as fats and starch, in the small intestine. Moreover, the slower digestion and absorption rate of carbohydrates leads to a reduced postprandial blood glucose response, which over the long term, improves insulin sensitivity and influences fuel partitioning to favour fat oxidation.[27] At present, the benefits of increased vegetable intake in the prevention and treatment of obesity and associated diseases such as diabetes type 2 and cardiovascular diseases are considered to be derived mainly from soluble fibre.

In the present study, we found that consumption of energy drinks was accompanied by a significant increase in FBG levels. Many health problems are reportedly caused by the consumption of energy drinks. Sugar and caffeine may also synergistically increase postprandial hyperglycaemia. It has been reported that energy drinks block insulin-stimulated glucose and reduce glucose uptake.[28] Additionally, the calories provided by energy drinks have many other adverse effects such as calcium deficiency, dental problems, hypertension, and increased BMI.[29,30] Thus, our results are consistent with those of other studies that reported that consumption of energy drinks could lead to diabetes because of imprecise and incomplete compensation for energy consumed in liquid form.[31]

We found that SBP was significantly higher in moderate smokers (1–5 years) than in those who never smoked, but no such differences were seen in DBP or for long-term smokers. Another study had similar findings.[32] Paradoxically, several studies have reported that blood pressure in smokers is the same as or lower than that in nonsmokers. Stranger still, some studies observed that SBP decreased as the level of cigarette consumption increased.[33,34] Smoking is the most common cause of avoidable cardiovascular mortality worldwide,[35] and a wealth of research demonstrates the pathophysiological mechanisms by which smoking causes an increase in blood pressure. The mechanism of nicotine induced-hypertension is believed to be via activation of the sympathetic nervous system with release of epinephrine and norepinephrine,[36] which increases myocardial oxygen consumption through a rise in blood pressure, heart rate, and myocardial contractility.[37] Chronic diseases such as combined chronic diseases, diabetes mellitus, cardiovascular disease, and cancer share major risk factors beyond genetics and social inequalities, including smoking and unhealthy diets.[38]

In the present study, leisure time did not differ significantly between the groups and health outcomes. It should be noted that sedentary time, such as daily sitting hours, was not measured in the current study. Previous studies reported no significant association between self-reported sitting time and weight gain.[39,40] Future studies should include objective measures that can help categorize individuals from the general population on the basis of daily activity and the extent of sedentary behaviour.

The main limitation of this study is its small sample size, although the sample was carefully selected from the main cities of Al-Khobar, Dammam, and Saihat in Eastern Province, KSA. Further large-scale studies are necessary to examine the association between lifestyle habits and metabolic syndrome markers. In addition, sitting time was not recorded and analysed, neither over the entire day nor separately during work and free time.

Conclusion

The significant relationship between the studied risk factors and adverse health outcomes could indicate an emerging health risk. There is a great need to encourage individuals to adopt a healthy lifestyle by tackling risk factors at the societal, community, and individual levels. Further, there is an obvious paucity of research on health risk factors in the Saudi population, and this research gap must be bridged.

Authors' contribution

MTH and SAA performed the measurements, and AMA was involved in planning and supervised the work, MTH contributed to the interpretation of the results. SAA and AMA processed the experimental data, drafted the manuscript and designed the figures and tables. All authors discussed the results and commented on the manuscript and approved the final draft and responsible for the content of manuscript.

Conflict of interest

The authors have no conflict of interest to declare.

Acknowledgements

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