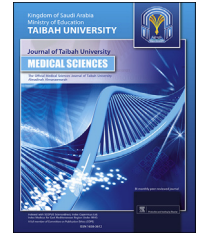Taibah University

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Original Article

Relationship between hair nicotine levels with blood pressure, body composition, lipid profile and leptin among healthy male smokers in Kelantan

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الملخص

أهداف البحث: هناك تقارير تؤيد أن تدخين السجائر يسبب ارتفاعا حادا في ضغط الدم. لذا، من المهم تقييم العلاقة بين التدخين المزمن، وضغط الدم، ومكونات الجسم، وملف الأيض الشخصي لإدراك التأثيرات طويلة الأمد للتدخين على وزن الجسم وصحته. بحثت هذه الدراسة العلاقة بين مستويات النيكوتين في الشعر، وضغط الدم، ومكونات الجسم، ومستوى الدهون، والليبتين بين المدخنين الذكور الأصحاء.

طرق البحث: في هذه الدراسة المقطعية، تطوع للدراسة ١٠٧ من المدخنين الذكور تتراوح أعمارهم بين ٢٠-٥٠ عاما. تم قياس مستويات النيكوتين في الشعر باستخدام مقياس الطيف اللوني الغازي للكتلة. كما تم قياس ضغط الدم، ومكونات الجسم (الوزن، والطول، ومؤشر كتلة الجسم، ونسبة الدهون في الجسم، والدهون بالأحشاء، ومحيط الخصر والورك، بالإضافة إلى معدل الأيض) ومستوى الدهون، وتركيز الليبتين وفقا لذلك.

النتائج: كان متوسط العمر ومؤشر كتلة الجسم بين الأشخاص ٣٧ عاما و ٢٤٫٥٩ كجم/م،٢ على التوالي. وسجلت متوسط فترة التدخين ١٦٫٩١ عاما. كما سجلت مستويات النيكوتين بالشعر بإيجابية مع الكوليسترول الكلي، ومستويات الدهون الثلاثية. لكن لم يكن هناك ارتباط كبير بين ضغط الدم، ومكونات الجسم، وتركيز الليبتين.

الاستنتاجات: العلاقة الإيجابية بين مستويات النيكوتين بالشعر، والكوليسترول الكلي، والدهون الثلاثية حددت الآثار الضارة للتدخين المزمن حتى بين المدخنين الذكور الأصحاء.

الكلمات المفتاحية: ضغط الدم؛ مكونات الجسم؛ ملف الأيض الشخصي؛ النيكوتين؛ التدخين

Abstract

Objectives: Cigarette smoking has been reported to cause acute blood pressure elevation. Therefore, it is important to assess the relationships between chronic smoking and blood pressure, body composition, and the metabolic profile to gain an understanding of the long-term effects of smoking on an individual's body weight and health. This study examined the relationships between the hair nicotine level, blood pressure, body composition, lipid profile, and leptin in healthy male smokers.

Methods: For this cross-sectional study, 107 male smokers aged between 20 and 50 years old were recruited as volunteers. The nicotine levels in the volunteers' hair were measured using gas chromatography-mass spectrometry. Moreover, the subjects' blood pressure, body composition (weight, height, body mass index, body fat percentage, visceral fat, waist and hip circumferences, and basal metabolic rate), lipid profile, and leptin concentration were also measured.

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Results: The means for age and BMI among the subjects were 37.00 (9.42) years and 24.59 (4.33) kg/m^2, respectively. The average length of time as a smoker was 16.91 years. The hair nicotine level was found to be positively correlated with the total cholesterol (r = 0.314, r^2 = 0.099, p = 0.028) and triglyceride (r = 0.351, r^2 = 0.0.123, p = 0.013) levels. However, no significant correlations were found between the hair nicotine level and blood pressure, body composition, or leptin concentration.

Conclusion: The positive correlations between the hair nicotine level and total cholesterol and triglyceride levels highlighted the harmful effects of chronic smoking, even among healthy male subjects.

Keywords: Blood pressure; Body composition; Metabolic profile; Nicotine; Smoking

Introduction

It has been well-established that smoking and obesity are significant causes of preventable morbidity and mortality.[1,2] For many years, smoking and obesity have posed a global growing public health burden. Deaths attributed to tobacco use have been estimated to increase annually, with low- and middle-income countries being the most affected.[2] Furthermore, both smoking and obesity have been revealed as modifiable factors that promote the development of cardiovascular disease (CVD). In fact, a vast amount of evidence supports the association between cigarette smoking and CVD, and smoking trends at present can determine how heavy the health burden of CVD will be among future communities.[3] Similarly, smoking has also been reported to increase blood pressure (BP) in smokers.[4] However, this finding remains controversial, as results showing similar or lower BP in smokers compared to non-smokers have also been reported in some epidemiological studies.[5,6]

Moreover, the relationship between smoking and obesity is complex and currently not well understood. In fact, several studies have reported that nicotine intake reduces food intake, increases energy expenditure, and decreases weight, whereas smoking cessation has been related to hyperphagia and weight gain.[7] Furthermore, a previous study indicated that tobacco users have a lower body mass index (BMI), a smaller waist circumference (WC), and a lower body fat percentage (BF) compared to non-tobacco users,[8] whereas other reports have indicated that smoking does not increase one's overall fatness, but does significantly increase abdominal and visceral obesity.[9,10]

Meanwhile, leptin, an adipocyte-derived signal molecule, interacts with specific receptors located in the central neural system and peripheral tissues and results in decreased food intake and increased energy expenditure.[11] Nevertheless, whether leptin concentration is affected by smoking has not been conclusively determined, as previous studies have produced varying findings pertaining to the association between smoking and leptin.[12–14]

Additionally, many studies in this area have used self-reporting data, such as the number of cigarettes smoked or packs per day, to identify an individual's smoking status. In this study, however, hair nicotine levels were employed as a biomarker to represent subjects' smoking status. Moreover, the relationships between the hair nicotine levels and the BP, body composition, lipid profile, and leptin concentration among smokers have not been previously examined. Therefore, in the present work, the relationships between the hair nicotine levels and the BP, body composition, lipid profile, and leptin concentration are examined in healthy male smokers.

Materials and Methods

Subjects

This cross-sectional study was conducted at the School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, Kelantan, from January to December 2012. One-hundred-seven active Malay male smokers participated in this study. All of the subjects were generally healthy: they had no history of chronic disease, were non-obese (BMI < 30 kg/m^2), were not on routine medications, and did not consume alcohol. However, subjects who had participated in weight loss and/or smoking cessation programmes were excluded from this study. The protocol of this study was approved by the Research Ethics Committee (Human) of Universiti Sains Malaysia and was conducted in accordance with the Helsinki Declaration. Additionally, written informed consent was obtained from all subjects prior to their participation in the study. Personal background information and smoking history were obtained through interview sessions.

Blood collection, blood pressure and body composition

All eligible subjects were requested to fast overnight before the measurement day. That morning, peripheral blood samples were collected and allowed to clot at room temperature before undergoing a serum separation process. The systolic and diastolic blood pressures (SBP & DBP) were measured on the right arm in the sitting position using an automatic digital blood pressure monitor (HEM-780, Omron, Japan) after 10 min of rest. Height was measured from the standing position using a portable body meter (206, Seca, Germany), and weight, body mass index (BMI), body fat percentage (BF), visceral fat (VF), and basal metabolic rate (BMR) were measured using a digital body composition analyser (SC-330, Tanita, Japan) that applied the principles of bioelectrical impedance analysis (BIA). Furthermore, waist and hip circumferences (WC & HC) were measured using body tape at the midway point between the lower rib margin and the iliac crest and at the maximal circumference over the buttocks, respectively, from the standing position.