Asian Pacific Journal of Tropical Biomedicine

journal homepage:www.apjtb.com

Document heading doi:10.12980/APJTB.4.2014D153

Correlation between anthropometric measurement, lipid profile, dietary vitamins, serum antioxidants, lipoprotein (a) and lipid peroxides in known cases of 345 elderly hypertensive South Asian aged 56-64 y-A hospital based study

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PEER REVIEW

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Comments

Over all the paper is very informative and gives very scientific information, which makes us to rethink on various aspects causing the higher blood pressure in subjects. This paper is written well with correlation of so many risk factors which could be additional causes of the extent of blood pressure changes apart from the ones published elsewhere. Further research could be initiated on extensive analysis of individual risk factors in a large number of subjects so that the relative risk could be stratified.
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ABSTRACT

Objective: To address the association of dietary vitamins, anthropometric profile, lipid profile, antioxidant enzymes and lipid peroxidation in hypertensive participant compared with normotensive healthy controls.

Methods: Dietary intake of vitamins was assessed by 131 food frequency questionnaire items in both hypertensive participants and normotensive age-sex matched healthy controls. The associated changes in serum antioxidants and lipid peroxidation were also assessed along with lipid profile and anthropometric measurements in both groups of subjects under study.

Results: Dietary vitamins intake was higher in hypertensive participants excepting for vitamin B2 and ascorbic acid compared to normotensive controls. Anthropometric variables in the hypertensive showed significant differences in weight, body mass index, waist circumference, hip circumference, waist-hip ratio and mid-arm circumference. The total cholesterol, low-density lipoprotein cholesterol, triglyceride were significantly higher (P<0.001) in hypertensive except high-density lipoprotein cholesterol which was significantly higher (P<0.001) in normotensive. The serum endogenous antioxidants and enzyme antioxidants were significantly decreased in hypertensive except serum albumin levels compared to normotensive along with concomitant increase in serum lipoprotein (a) malondialdehyde and conjugated diene levels.

Conclusions: Based on the observations, our study concludes that hypertension is caused due to interplay of several confounding factors namely anthropometry, lipid profile, depletion of endogenous antioxidants and rise in oxidative stress.

KEYWORDS

Anthropometry, Lipid profile, Dietary vitamins, Antioxidants, Lipid peroxides, Lipoprotein (a), Hypertension, South Asian

1. Introduction

Hypertension is one the major public health problem worldwide[1]. Those individuals who are hypertensive are also at an increased risk for stroke, heart disease, and renal failure. Etiological factor related to essential hypertension has a genetic component but, lifestyle factors such as diet, sedentary habits, lack of exercise, smoking also have an impact in causation of hypertension[2]. In experimental studies, both human and animal models, Insulin resistance and glucose intolerance are most commonly observed phenomenon in relation to hypertension[3]. Increased reactive aldehyde, methylglyoxal is an aftermath of aberration in glucose metabolism[4]. Methylglyoxal binds

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Foundation Project: Supported by a grant from Confederation of Epidemiological Associations registered under Government of Kerala (Grant No. 30-955/2012 CEA).

Article history:
Received 12 Jan 2014
Received in revised form 20 Jan, 2nd revised form 23 Jan, 3rd revised form 31 Jan 2014
Accepted 22 Feb 2014
Available online 28 Apr 2014

to both sulfhydryl and amino groups of proteins forming conjugates/advanced glycation end products. This disrupts protein structure and function furthermore can affect vascular calcium channels, enzymes, and tissue proteins leading to increased oxidative stress[2]. These alterations also impair endothelial functions with uninterrupted increase in intracellular free calcium, peripheral vascular resistance, and hypertension[5]. Even though it sounds simple, but the relationship between hypertension, oxidative stress and antioxidants is very complex and inadequately understood. Oxidative stress may play a role in the patho-physiology of hypertension as proved by experimental evidence but the same mechanism does not conform in humans. However it is suggested by research findings that *in vivo* oxidation of low-density lipoproteins, primarily by oxygen-free radicals, may increase atherogenesis[6]. Hypertension associated long-term infusion of angiotensin II is linked to the stimulation of oxidant production, leading to reduced bioactivity of NO and the activation of NAD(P)H oxidase[7].

The relationship of hypertension with antioxidants and oxidative stress is therefore of much interest. Various scientific studies[8] have reported on the associations between antioxidants and cardiovascular disease, myocardial infarction and mortality, but fewer studies have focused on the relationship between antioxidant measures and hypertension. Even though, study suggested no concrete links and evidence of an association between blood pressure and intakes of either carotene or vitamin E, still mixed reports have come up where links between blood pressure and dietary antioxidants have been re-established.

Several studies have linked dietary supplementation with antioxidants rich vegetables and fruits including ascorbic acid, vitamin B1, B2 and B3 along with vitamin A and the quinone enzyme Q10 in decreasing blood pressure in animal models and humans with essential hypertension[9]. These antioxidants can act as potent antihypertensive agents by reducing aldehyde conjugate/advanced glycation end product formation and oxidative stress, by improving insulin resistance and endothelial function, or by normalizing calcium channels and peripheral vascular resistance[10].

Study conducted among Australians has shown that the levels of antioxidants are lower and levels of uric acid and malondialdehyde are higher in hypertensive participants compared to normotensive participants[11]. So, dietary supplementation with antioxidants proves to be a beneficial, inexpensive, first-line alternate treatment modality for hypertension. It is reported that increased oxidative stress may be both a cause as well as a consequence of hypertension[12]. Based on *in vivo* experimental evidence it is shown that oxidized low-density lipoproteins (LDL) formed by oxygen-free radicals may increase hypertension-related atherogenesis, and antioxidants may be beneficial in this regard[9]. Previous findings concerning associations between serum measures of antioxidants and hypertension have however been inconsistent.

In the current study it is hypothesized that some significant association between serum levels of antioxidants and markers of oxidative stress with hypertension could be established.

2. Materials and methods

Three hundred and forty five hypertensive participants and 345 age-sex matched normotensive healthy controls were taken for this study. The study was conducted for a period of three years from May 2007 to April 2010. The design of this study was pre-approved by the Institutional Ethical Committee Board of the institution and informed consent was obtained from the hypertensive participants and controls.

2.1. Cases

Eligible cases with patients aged 56-64 year (201 men and 144 women) who were diagnosed of hypertension were recruited for the study.

2.2. Controls

For each case subject, 2 control subjects matched by age (within 5 years), sex, and hospital were obtained from outpatient clinics or inpatient wards. The study identified 345 eligible control subjects. Controls were selected by using predominantly any of these two methods depending on the hospital. In the first method, we accompanied a particular physician during an outpatient clinic, according to a weekly schedule of clinics and wards. At the end of each consultation, the physician or the physician's assistant invited the patient to speak with us about his or her lifestyle and diet. Patients matching the required age and sex profile were eligible according to study criteria and were then informed of the study and asked to participate. In these situations, participation was 100%. In the second method, we independently identified control patients from clinics and wards. We attempted to approach all individuals present in a particular outpatient clinic or in a specified ward. In large clinics, patients were screened for eligibility and invited to participate according to their queue number (highest number first). This method was used to prevent bias in the selection of controls. Overall participation was high (97%). Basic demographic information was collected from all persons who were approached. If an individual fit the required age and sex profile and was eligible, we briefly explained the study and asked whether the patient was willing to participate. Thus the study included 345 age-sex matched healthy volunteers (201 men and 144 women).

2.3. Data collection

Interviews were conducted in hospital wards or clinics by us and lasted 30 min. Informed consent was obtained from all study subjects. The interviews included various life style factors such as education, socio-economic status, income and type of job. Details of major cardiovascular risk factors such as smoking, alcohol intake, diabetes, obesity and hypertension were obtained. We also collected data on socioeconomic status, smoking history, diabetes, and hypercholesterolemia, family history of cardiovascular disease (including ischaemic heart disease, angina,