Research Article

Apolipoproteins and lipid profile in patients with oral diseases and systemic arterial hypertension

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Date Submitted: 10/6/2015
Date Accepted:13/1/2016

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Abstract

Background: Systemic arterial hypertension and dyslipidemia are major risk factors for cardiovascular disease, and have been shown to be associated with oral diseases.
Objective: The objective of this study was to estimate apolipoproteins and lipid profile in patients with oral diseases and systemic arterial hypertension.
Methods: This study was conducted at Medical City Hospital during the period from October 2014 until the end of April 2015. Sixty arterial hypertensive patients were enrolled in this study; their age range was (38-50) years and they were compared with 30 healthy subjects as control group. Apolipoproteins A1, B, and lipid profile were estimated for each subject.
Results: The serum levels of apolipoprotein B, total cholesterol, triacylglycerol, and low density lipoprotein cholesterol were higher while apolipoprotein A1 and high density lipoprotein cholesterol levels were lower in hypertensive patients with oral diseases as compared to the control, which was statistically significant ($P < 0.05$).
Conclusion: Hypertensive patients with oral diseases had dyslipidemia and need measurement of blood pressure and lipid profile at regular intervals to prevent comorbidities.

Key words: Oral diseases, Hypertension, Dyslipidemia.

INTRODUCTION

Arterial hypertension (HTN) was defined as a blood pressure (BP) ≥140 mmHg and/or ≥90 mmHg, and/or use of antihypertensive medication [1]. Hypertension occurrence varies by age, race, education, and so forth [2, 3].Patients with arterial HTN are at increased risk of developing adverse effects with dental diseases [4]. Periodontal disease is often modified by systemic diseases [5]. The periodontal diseases are a group of chronic inflammatory diseases, involving the soft tissue and bone surrounding the teeth in the jaws. Periodontal diseases are characterized by inflammation of tooth-supporting tissues caused by bacterial infection [6]. Gingivitis is a very frequent reversible condition, which may progress into periodontitis with further destruction of periodontal tissues ligament [7]. This process is attributed to the release of toxic products from the pathogenic bacteria plaque in addition to the inflammation of gingival tissues elicited by the host response. Hypertension increases the risk of a range of adverse cardiovascular (CV) events such as atherosclerosis, stroke, and coronary heart disease [8].

It is well identified that arterial hypertension and periodontitis share common risk factors, namely, smoking, stress, increased age, and socioeconomic factors. However, according to the scientific statement issued by the American Heart Association (AHA) published in circulation, observational studies support an association between periodontal disease and cardiovascular disease (CVD), independent of shared risk factors [9]. There are also some studies that have been focused on antihypertensive treatment and oral diseases stating that patients under antihypertensive treatment show positive effects on periodontitis i.e. they have increased number of pockets and there is a linear trend between periodontal disease severity and antihypertensive treatment [10]. Recent studies have shown that the inflammatory property of periodontal disease help to promote blood clot formation in arteries [11]. Moreover, periodontitis patients also were found to

have higher levels of plasma oxidized low density lipoprotein (LDL) levels, which means higher risk of developing atheroma plaque [12].Apolipoprotein B (apo B) is the major proteins of LDL, and apo A1 is the major protein of high density lipoprotein (HDL). Because of their associations with the respective lipoproteins, apo B is positively and apo A1 is inversely associated with CV risk [13].The aim of the present study was to estimate apolipoproteins and lipid profile in patients with oral diseases and systemic arterial HTN.

PATIENTS AND METHODS

This study was conducted at the Medical City Hospital during the period from October 2014 until the end of April 2015. Sixty hypertensive patients were enrolled in this study; their age range was (38-50) years and they were compared with 30 healthy subjects as control group.

Oral Examination:Oral manifestations mainly observed were gingivitis, periodontitis, lichenoid reactions, hyposalivation, and facial nerve paralysis. Gingivitis and periodontitis were confirmed from patients Russell's periodontal index, and hyposalivation was noted by asking questions to the hypertensive patients regarding symptoms [14].

Measurements: Body mass index (BMI) was calculated as weight in kilograms, divided by height in meters squared (kg/m^2) and waist circumference (WC) was measured from every individual. Blood pressures were recorded according to the guidelines adopted by WHO [15]. Hypertension was defined as an average systolic blood pressure (SBP) ≥140 mmHg and diastolic blood pressure (DBP) ≥90 mmHg without antihypertensive medication according to the 7th report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC-7) [16].

Biochemical Analysis: About 5 milliliters of blood sample was obtained from every patient and control. The separated serum was used for measurements of apolipoproteins and lipids. Apo A1 and apo B were measured by turbidimetry while lipids were estimated by enzymatic colorimetric methods.

Statistical Analysis: Statistical analysis was done by using an excel program version 16. T-test was used to estimate P value. P value less than 0.05 was set to indicate significant difference.

RESULT

Oral manifestations in hypertensive patients are shown in table (1) and figure (1). Around 85.5% of patients presented with gingival bleeding on probing and were characterized by redness of the marginal gingiva. 15.3% of patients presented with hyposalivation. 3% of the total patients presented with lichenoid reactions and they were characterized by linear striations occurring on the buccal mucosa. 1.5% of patients presented with facial nerve paralysis and 15% patients presented with gingival enlargement characterized by firm nodular gingival overgrowth seen on both buccal and facial and lingual or palatal aspects of the marginal gingival. 80.5% of the patients under study presented with Russell's periodontal index score ranging from 2-4.9.

Distribution of demographic and medical variables in hypertensive group is shown in table (2). Hypertensive patients had high levels of apo B, TC, TAG, and LDL-C ($P< 0.05$) while had a low levels of apo A1 and HDL-C ($P= 0.05$), table (3).

Table 1. Oral manifestations in hypertensive patients

Parameter	Hypertensive
Number	60
Gingival Bleeding	85.5 (51%)
Hyposalivation	9 (15.30%)
Lichen Planus	2 (3.0%)
Facial Paralysis	1 (1.50%)
Gingival Enlargement	9 (15.0%)
Peridontitis	48 (80.50%)

Table 2. Distribution of demographic and medical variables in hypertensive group

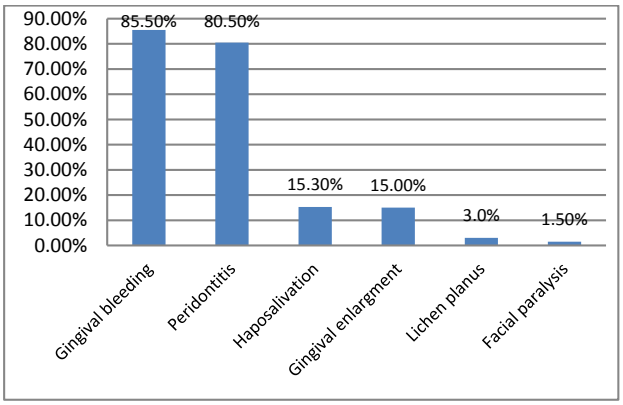
Parameter	Frequency (%)
Demographic Variables:	
- Age	
38-50	40 (67%)
50-56	20 (33%)
- Gender	
Male n. (%)	30 (50%)
Female n. (%)	30 (50%)
- Duration of Hypertension	
2-5 years	45 (75%)
5-10 years	15 (25%)
- Stage of Hypertension	
Stage 1	20 (33%)
Stage 2	25 (42%)
Stage 3	15 (25%)
Medical Variables:	
- BMI	
< 30 kg/m^2	40 (67%)
> 30 kg/m^2	20 (33%)
- WC	
≤ 85 cm	42 (70%)
≥ 90 cm	18 (30%)
- Drugs Uses	
Diuretics	9 (15%)
β-blockers	11 (18%)
Vasodilators	40 (66%)

Table 3. Biochemical characteristic of hypertensive and control group

Clinical Data	Hypertensive	Control	P Value
Age (Years)	47.0 ± 9.15	42.38 ± 3.60	0.001
SBP (mmHg)	147.12 ± 8.20	118.21 ± 5.30	0.001
DBP (mmHg)	98.0 ±7.39	75.0 ±5.22	0.012
BMI (kg/m^2)	28.20± 3.90	26.70± 4.30	0.15
WC (cm)	87.01 ± 3.89	75.20 ± 5.14	0.001
Apo A1 (mg/dl)	138.0± 2.50	174.0± 2.30	0.001
Apo B (mg/dl)	145.20 ± 3.80	68.50 ± 3.45	0.001
TC (mg/dl)	194.20 ± 6.42	169.70 ± 19.20	0.01
TAG (mg/dl)	194.20 ± 9.49	128.50 ± 14.0	0.001
HDL-C (mg/dl)	40.80 ± 7.20	55.0 ± 4.60	0.05
LDL-C (mg/dl)	115.70 ± 5.96	89.1 ± 18.50	0.003
VLDL (mg/dl)	38.0±19.0	26.50 ± 5.30	0.05
Duration of Hypertension (Years)	6.0±4.5	-	-

*** P < 0.05**

Figure 1. Oral manifestations observed in hypertensive patients



DISCUSSION

Hypertension or arterial HTN is a chronic medical state in which the BP in the arteries is elevated [17]. Gingival bleeding was one of the frequent clinical features seen in hypertensive patients with 80.5% of the hypertensive patients presented with the symptoms of periodontitis, which was similar to the results of Maiborodin et al., study [18].

One of the main risk factors for hyposalivation is the use of certain medications. In addition, polypharmacy has been revealed to significantly influence patients' saliva flow [19]. Hyposalivation was related to elevating BP and in patients who were under antihypertensive medication especially with diuretics such as thiazides and calcium channel blockers [20].

The results of this study showed that 15.3% of hypertensive patients who were under medication with diuretics presented with hyposalivation. These results were similar to the study of Glick et al., [21].

Gingival enlargement is also one of the most frequent clinical finding in patients with HTN taking antihypertensive medication particularly calcium channel blockers which is in agreement with the study of Andrew et al., [22]. Gingival enlargements appear clinically as an excessive growth of the gingiva which may occur as a side-effect of systemic medications [23].

Lichen planus are white lesions characterized by linear striations occurring on the buccal mucosa. These are sometimes seen in hypertensive patients as a manifestation secondary to the use of the drug or medication [24]. The results of this study showed 3% of hypertensive patients with lichen planus and as their investigation, it is supported the hypothesis of relationship between lichen planus and HTN. The results were parallel to the study of Harting and Hsu [25].

Facial nerve paralysis in HTN is because of edema or hemorrhage in the facial canal, but the exact etiology is unknown. Usually facial nerve paralysis is seen in patients with malignant hypertension. It is characterized by the sustained increase in SBP ≥ 200 mmHg and/or sustained increase in DBP ≥ 120 mmHg. The results of the present study were similar to the study results of Margabanthu et al., [26].

There is growing evidence that suggests a relationship between periodontitis and the risk factors for CVD, including dyslipidemia and HTN [27].

Additional prospective mechanisms have become clear: continuous and lasting exposure to bacteria of the oral cavity or bacterial toxins may initiate pathological changes in blood vessel walls and therefore act as a precursor of atherosclerosis in susceptible hosts. In this way, periodontal pathogens can penetrate the epithelial barrier of periodontal tissues and achieve systemic spread through the bloodstream [28]. By this dynamic mechanism, periodontal pathogens can infect the vascular epithelium and atherosclerotic plaques, causing inflammation and plaque instability followed by acute myocardial ischemia. Furthermore, periodontal pathogens produce a variety of virulence factors that have deleterious effects on the vascular system, resulting in platelet aggregation and adhesion and formation of lipid laden foam cells and deposits of cholesterol that contribute to the formation of atheromas [29].

The role of apo A1 which generally has anti-inflammatory and atheroprotective properties has been examined in the development of pre HTN and HTN [30].

The means values of serum apo B, TC, TG, and LDL-C were significantly higher and statistically significant between the hypertensive patients compared to the control. The means values of serum apo A1 and HDL-C

levels were lower in the hypertensive patients compared to the control and were statistically significant.

Present findings and those of others discussed indicate that any relevant degree of pro-inflammatory state offsetting the balance of anti-inflammatory processes may be prominently involved in the development of HTN, be it low levels or dysfunctional high levels of apoA1, HDL particles or elevated concentrations of apo B. These findings are similar to the findings of some other studies [31, 32, 33].

In conclusions, the results of this study suggest that hypertensive patients with oral diseases had a disturbance in lipoprotein metabolism. High levels of pro-inflammatory apo A1 may thereby be accounted for a prospective association with HTN.

Recommendations: Hypertensive patients with oral diseases need measurement of BP and lipid profile at regular intervals throughout their primary health care to prevent CVD and stroke. Oral health programme should be emphasized in the preventive measure.

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