ABSTRACT

Aims: Prostaglandins and Thromboxane A2 are prostanoids, with platelet aggregator and vasoconstrictor properties. This study was carried out to assess the prostaglandins and thromboxane status of patients with cardiovascular diseases in Ekiti State, Nigeria.

Study Design: This is a comparative study.

Methodology: Two hundred patients with various cardiovascular diseases (Stroke, Ischemic heart disease, Hypertension, Hypertension with diabetes and Hypertension with Obesity) were recruited from Federal Teaching Hospital, Iddo Ekiti and Ekiti State Teaching Hospital, Ado Ekiti. Thirty subjects without cardiovascular diseases were used as a control. Their age range was between 30 and 90 years. Plasma prostaglandin, PGD2, PGE1 and thromboxane TXA2 were evaluated in all groups by the use of Enzyme-Linked immunosorbent assay (ELISA). The data obtained was subjected to student t-test and ANOVA.

Results: The results showed a significant increase (P>0.05) in the plasma levels of prostaglandin...
1. INTRODUCTION

Cardiovascular disease (CVD) is a class of diseases that involve the heart or blood vessels. Cardiovascular disease includes coronary artery diseases (CAD) such as angina and myocardial infarction commonly known as a heart attack [1,2]. A study reported that the rate of death due to cardiovascular disease among persons 15 to 59 years of age is 3 to 8 times as high in Tanzania and Nigeria as in England and Wales [3]. World Health Organization report (2002) revealed that 80% of deaths from cardiovascular diseases and 87% of related disability currently occur in low and middle-income countries [4] like Nigeria. Prostanoids are cyclooxygenase-dependent products of arachidonic acid metabolism, comprising prostaglandin (PGD2, PGE2, PGF2), prostacyclin (PGI2) and thromboxanes (TXA2) [5]. Prostanoids are involved in vascular homeostasis and hemostasis [6]. Prostaglandins and thromboxane A2 (TXA2), also known as prostanoids, are formed when arachidonic acid (AA), a 20-carbon unsaturated fatty acid, is released from the plasma membrane by phospholipases and metabolized by the sequential actions of PGG/H synthase or by cyclooxygenase (COX) and their respective synthases [6]. PGD2 is a major eicosanoid synthesised in the central nervous system and peripheral tissues, and it has both an inflammatory and homeostatic capacity [7]. PGE2 inhibits expression of proinflammatory genes such as iNOS and plasminogen activator inhibitor [8]. It is a potent bronchoconstrictor, neuromodulator and antithrombin agent [7]. PGE1 is a potent vasodilator of all arteries and also inhibit platelet aggregation and stimulation of uterine and intestinal small muscle. Thromboxane (Tx) is produced locally by platelets, macrophages, human cardiac atrial tissue, vascular smooth muscle cells of arteries, veins and endothelial cells [9]. It is also a potent vasoconstrictor, a stimulator of vascular smooth muscle cell growth and is a positive inotropic mediator in the heart [10]. Increased production of TXA2 and platelet aggregation has been observed to be associated with atherosclerosis, and coronary artery disease [11]. In healthy individuals, the majority of TXA2 is generated by platelets in response to an array of physiologic agonists. TXA2 not only mediates activation of the platelet in which it is formed, but it is also released where it can activate adjacent quiescent platelets and stimulate arterial vasoconstriction through binding to specific cellular receptors [12]. This study is therefore aimed at assessing and comparing the levels of plasma prostaglandin and thromboxane levels in diseased cardiovascular patients in Ekiti State, Nigeria.

2. MATERIALS AND METHODS

2.1 Study Design

Subjects: Two hundred cardiovascular diseased patients between the ages of 30 and 90 years attending the outpatients unit of Federal Teaching Hospital, Ido Ekiti and Ekiti State Teaching Hospital, Ado Ekiti were recruited for this study. Subjects without cardiovascular diseases or any other complications were used as controls. Questionnaires to obtain the demographic and anthropometric characteristics were issued to the participants and informed consent form was duly signed. Ethical clearance was given by Ethical Committee of the Federal Medical Centre, Ido Ekiti, Ekiti State.

2.2 Sample Collection

Five milliliters (5 mls) of blood was collected from the antecubital vein of each subject using sterile, non-toxic, pyrogen-free, disposable plastic syringe into an anticoagulant bottle containing Ethylene Diamine Tetraacetic Acid (EDTA). Centrifugation collected plasma at 1000 revolution per 10 mins and immediately stored at -20°C prior analysis.

2.3 Plasma Analysis

Evaluation of plasma PGD2, PGDE-1 and TXA2 was done by using Enzyme Linked
Table 1. Levels of prostaglandins and thromboxane in cardiovascular diseased patients and healthy subjects

<table>
<thead>
<tr>
<th>Subjects</th>
<th>PGD-2 (ng/l)</th>
<th>PGE1(ng/l)</th>
<th>TXA2 (pg/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>83.78±0.1.46a</td>
<td>102.03±4.45a</td>
<td>42.59±1.68a</td>
</tr>
<tr>
<td>Stroke</td>
<td>387.57±46.41b</td>
<td>338.82±45.18b</td>
<td>105.78±9.61c</td>
</tr>
<tr>
<td>Ischemic Heart Disease</td>
<td>343.22±25.66b</td>
<td>503.12±50.48b</td>
<td>77.63±7.71b</td>
</tr>
<tr>
<td>Hypertension</td>
<td>268.43±25.66b</td>
<td>445.80±32.51c</td>
<td>70.55±2.30b</td>
</tr>
<tr>
<td>Hypertension with Diabetes</td>
<td>296.07±21.20b</td>
<td>283.63±32.06b</td>
<td>75.25±7.72b</td>
</tr>
<tr>
<td>Hypertension with Obesity</td>
<td>401.62±81.60b</td>
<td>469.03±65.92c</td>
<td>74.90±6.83b</td>
</tr>
</tbody>
</table>

Values are expressed as mean ±SEM. Values of the same subscript within the same column are not significantly different at (p>0.05) between control and test group, while values with different superscripts are significantly different (p<0.05).


2.4 Statistical Analysis

Data were statistically analysed by using SPSS version 17.0. Data obtained were subjected to descriptive analysis using student t-test and One-way Analysis of Variance (ANOVA). The results obtained was grouped and expressed as mean ± Standard Error of Mean (SEM). The significant difference set at P< 0.05.

3. RESULTS

There was a significant increase (P<0.05) in plasma levels of PGD2, PGE1 and TXA2 in all the types of diseased cardiovascular patients when compared with the control. Levels of PGE1 was significantly higher than PGD2 and TXA2 in all subjects with cardiovascular disease. Plasma levels of TXA2 were found to be significantly higher in stroke patients when compared with the other types of cardiovascular disease patients. (Ischemic heart disease, Hypertension, Hypertension with diabetes, Hypertension with Obesity).

According to the results obtained from this study, plasma levels of TXA2 was found to be significantly higher in stroke patients (p<0.05) which is similar to the work of [18]. Stroke has been found to be associated with hyperaggregability of platelets and increased thromboxane A2 levels in blood, urine, and tissues. TXA2 has been shown to be involved in vascular contraction and has been implicated in platelet activation. In fact, increased TXA2 production was found in a study to occur episodically during the first 2 to 3 days after the onset of ischemic stroke [19], thus suggesting its cyclooxygenase-dependent formation in platelets [20].

5. CONCLUSION

The results of this study show that the assessment of plasma prostaglandin and thromboxane levels are essential indices in the diagnosis of cardiovascular diseases.

CONSENT

All authors declare that written informed consent was obtained from the patients before sample collection.

ETHICAL APPROVAL

All authors hereby declare that ethical clearance was given by Ekiti State Ethical Committee, Ekiti State Nigeria.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Shanthi Mendis, Pekka Puska, Bo Norrving. Global atlas on cardiovascular
5. Osterund B, Bjorklid E. Role of monocytes in atherogenesis. Physiol Rev. 2003;83: 1069-1112

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