PLASMA INSULIN PATTERN IN A HAUSA-FULANI ETHNIC GROUP IN NORTHERN NIGERIA

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Abstract
Background: Plasma insulin levels seem to play significant roles in health and disease; and prevailing plasma insulin levels are modulated by racial and ethnic factors. There has been no previous study of the plasma insulin pattern in any northern Nigerian tribe.
Methods: Thirty-six (24 males and 12 females) healthy volunteers of a northern Nigerian tribe were studied. Fasting plasma insulin and glucose levels were estimated; this was followed by a standard OGTT to study the plasma insulin response to oral glucose challenge.
Results: Although there were marked individual variations with 16.7% of individuals demonstrating fasting hyperinsulinaemia, mean fasting plasma insulin levels were similar to those earlier reported elsewhere.
Conclusion: These findings are discussed in view of other factors known to modulate plasma insulin levels.

Key words: Plasma Insulin, northern Nigeria

Introduction
Insulin, the primary anabolic hormone of the human body has been implicated in the aetiopathogenesis of several non-communicable diseases like hypertension, peripheral vascular disease, coronary heart disease and even cancer. 1-4 There is evidence that the pattern of fasting plasma insulin and plasma insulin response to oral glucose challenge is modulated by racial and ethnic factors, 5, 6 as well as such other factors as diet and physical activity. 7 Although there are few studies on plasma insulin levels in few ethnic groups in Nigeria, 5, 6 there has been no study of plasma insulin levels in any northern Nigerian ethnic group. The plasma insulin response to a standard oral glucose tolerance test (OGTT) in 36 healthy normoglycaemic individuals of Hausa-Fulani ethnicity in Zaria, northern Nigeria was studied.

Subjects and Methods
Zaria (located at Longitude 080 300 East and latitude 040 000 North of the equator) in Northern Nigeria is inhabited mainly by two tribes. The Hausa and Fulani (Fulbe); are two distinct tribes with similar cultural practices. Intermarriage between these tribes occurs quite frequently especially in urban areas of northern Nigeria, making it difficult to come across a ‘pure’ breed of any of the tribes in most of the urban areas of northern Nigeria. The term Hausa-Fulani has therefore been unofficially adopted and commonly used to refer to the two groups or a hybrid of the two.
Hausa-Fulani volunteers were recruited after community visits to explain the nature and aims of the study. The exclusion criteria were: Clinical evidence of any illness, personal or family history of diabetes or hypertension, current use of any form of medication and engagement in competitive sports.
Informed consent was obtained from all subjects; this was followed by metabolic studies. After an overnight ten to twelve hours fast, commencing between 21.00 to 22.00 hours the preceding night. On the day of the studies, Information on age, sex and anthropometric measures were obtained from all subjects. Weights (in Kg) were taken with only undergarments to the nearest 0.5kg. Heights (in meters) were taken to the nearest 0.5 cm with subjects standing erect without shoes or headgear. Body Mass Index (BMI) was derived by dividing body weight by the square of the height BMI of >25 kgm-2 was considered overweight. 12

Fasting venous blood samples were drawn from each subject using 18 gauge needles fitted with plastic canulae. The canulae were then kept patent by slow infusions (3-5 drops per minute) of 0.9 percent saline without any additive. The fasting blood samples were promptly centrifuged and analyzed promptly for glucose using a glucose oxidase method. 13 Aprotinin 200 KIU/ml was added to part of the sample reserved for insulin assay 14. These samples were immediately refrigerated and frozen at 20°C until
analysis. Following the withdrawal of fasting blood samples, 75 grams of anhydrous glucose dissolved in 300ml of water was given to each subject. Each subject completed this within five minutes; the time of commencement of the drink is recorded as time zero minute of oral glucose tolerance test (OGTT). Blood samples were taken at times 30, 60, 90 and 120 minutes of OGTT by temporarily stopping the slow saline infusion for a minute. The blood samples were treated just as the fasting samples. Insulin assay was performed using a commercially available ELISA human insulin kit (DRG instruments Gmbh, Marburg, Germany cat. no. EIA 2935). The kit has inter-assay and intra-assay coefficients of variation of 5.2 % and 4.8% respectively, sensitivity of 99% for human insulin and does not cross react with proinsulin.

Results are presented as mean ± standard deviation. Logarithmic transformation of plasma insulin values was done before analysis, as the raw values were not normally distributed.

Results

A total of 36 volunteers who met the inclusion criteria participated in the study. This was made up of 12 (33.3%) females and 24 (66.7%) males. Mean age was 48.6 ± 9.8 years (range 36-69 years). Nine (23%) of the subjects had body mass index of greater than 25kgm⁻² and were considered overweight.

There were marked individual variations in the fasting plasma insulin levels necessitating logarithmic transformation (Figure 1). Six (16.7%) individuals had fasting plasma insulin levels more than 2 SD above the mean and were regarded as exhibiting fasting hyperinsulinaemia. Marked individual variation was also noted in the plasma insulin response following oral glucose challenge. The mean ± standard deviation (SD) fasting plasma insulin level among the 36 subjects was 5.72 ± 2.16.

When the groups were subdivided as overweight and normal weight, there was no significant difference between the two groups, p = 0.4187. The respective values were 5.62 ± 2.70 and 5.91 ± 1.94 micromoles per liter.

The mean plasma insulin levels and the range of values observed following oral glucose administration are shown on table 1 with the corresponding plasma glucose levels.

Table 1: Mean plasma glucose and mean plasma insulin levels during OGTT in a Hausa-Fulani population in northern Nigeria

<table>
<thead>
<tr>
<th>OGGT time</th>
<th>Plasma glucose (mmol/L)</th>
<th>Plasma insulin (micro-units/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td>3.95 ± 0.49</td>
<td>5.72 ± 2.16</td>
</tr>
<tr>
<td>30 minutes</td>
<td>7.55 ± 0.42</td>
<td>15.58 ± 2.51</td>
</tr>
<tr>
<td>60 minutes</td>
<td>6.94 ± 0.54</td>
<td>13.67 ± 2.46</td>
</tr>
<tr>
<td>90 minutes</td>
<td>6.45 ± 0.47</td>
<td>10.84 ± 2.41</td>
</tr>
<tr>
<td>120 minutes</td>
<td>5.63 ± 0.51</td>
<td>8.03 ± 2.38</td>
</tr>
</tbody>
</table>

Values are presented as mean ± S.D

Discussion

Fasting plasma insulin levels in this study were similar to the ones earlier reported by Ezenwaka et al.¹⁰ and Osei et al.⁹ in southwestern Nigeria. They respectively reported mean ± standard deviation values of 5.8 ± 5.6 micro-units/ml and 4.5 ± 1.8 micro units respectively for fasting plasma insulin levels among the Yoruba ethnic group of southwestern Nigeria. But much lower than the value of 29.1 ± 5.4 micro units /ml reported in normal
African subjects in South Africa by Omar and Asmal. Although it is difficult to distinguish the effect of race from other confounding factors such as diet, there is compelling evidence to suggest a role for racial factors in modulating insulin secretion. Normoglycaemic Pima Indians for example have been shown to produce two to three times as much insulin when compared to their Caucasian counterparts. Similarly, plasma insulin levels both basal and following oral glucose challenge has been shown to be significantly higher among Micronesians compared to their Polynesian counterparts despite comparable levels of glycaemia. However, Kuku and Boyo in a study of forty healthy Africans in Lagos western Nigeria found plasma insulin levels comparable to those reported for Caucasians. This could be attributable to the metropolitan nature of Lagos with life-styles comparable to that obtained in Caucasian communities.

It is noteworthy and indeed worrisome that 16.7% of the subjects in this study demonstrated fasting hyperinsulinaemia, this perhaps is due to the changes in life styles that is been witnessed in most developing countries. Anecdotal evidence suggests that more and more people in this environment especially residents of urban areas, are increasingly living more sedentary lifestyles in addition to consumption of more refined foods. In southwestern Nigeria, Ezenwaka et al had expectedly found tendency to hyperinsulinaemia to be more common among urban dwellers than rural dwellers near Ibadan.

Differences in dietary composition between the populations may explain some of the differences observed. It is known that high total and saturated fat intake are associated with higher fasting plasma insulin concentrations while high dietary fiber is associated with low fasting insulin levels. Other factors such as glucose intolerance or hypertension have been excluded by the selection criteria used in this study. Following oral glucose administration, the plasma insulin response was as expected brisk and proportional to the prevailing plasma glucose levels.

Although the sample size is limited by availability of resources, the finding of hyperinsulinaemia in more than 16% of subjects in this study is worrisome considering the emerging role of insulin resistance as a cardiovascular risk factor. Obviously larger prospective studies on the beta-cell function and insulin sensitivity in this population are required.

References