α - Amylase activity in the saliva and plasma of habitual alcohol drinkers

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Abstract

This study reports on the influence of habitual alcohol drinking on α – amylase activity in individuals yet to manifest any physical or clinical sign associated with such drinking habit. α–Amylase activity was determined in saliva and plasma samples from randomly selected volunteers. Twenty-five male heavy drinkers and equivalent number of sex, age and weight-matched non-drinkers, all in apparent good health were enlisted for the study after obtaining their consent. Mean α–amylase activity in saliva and plasma was significantly higher (p<0.05) in habitual drinkers (185.0±6.0 IU/L; 113.5 ± 4.0 IU/L) than in non-drinking controls (144.0 ± 8.0 IU/L; 72.5±3.5 IU/L). Significant increase in both saliva and plasma α–amylase activity could be used in the early diagnosis of heavy alcohol drinking.

Key words: α-amylase, saliva, alcohol, Urhobo

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INTRODUCTION

Ethanol, a primary monohydric alcohol consumed in several forms, is not only a pharmacological substance commonly abused by man, but is also one of the few nutrients that is profoundly toxic (Preedy, et al., 1999). When consumed in small or moderate amounts, alcohol could be benign to body tissues, but when consumption becomes excessive and habitual, it may affect cellular metabolism and induce a wide range of organic lesions ranging from liver damage and toxicity to the brain, to alterations in the lobular architecture of the pancreas (Zima, 1993; Norton, et al., 1998).

When taken, alcohol is directly absorbed through any mucosal surface by simple diffusion into the blood stream, where it is transported to the liver, and then, to systemic circulation including all tissues and fluids (Kalant, 1971). Oxidation of the ingested alcohol to acetaldehyde and then, to carbon (IV) oxide, CO₂ and water, H₂O is respectively catalyzed by NAD⁺-dependent alcohol dehydrogenase (ADH) and aldehyde dehydrogenase (ALDH) (Kuston, 1996). ADH exists in multiple molecular forms in the body primarily in the stomach and liver and so, oxidation of alcohol occurs mainly in the liver and stomach (Baraona, et al., 1991).

In the early history of alcohol research, caloric interactions were among the most intensely studied, and that time, available evidence showed that diet affects ethanol absorption (Welling, et al., 1977). Recently high carbohydrate diet has been demonstrated to reduce ethanol absorption most, followed by high fat diet and then, high protein diet. (Jones and Jonsson, 1994). Diet with a high carbohydrate content inhibited ethanol absorption to the extent that extremely low levels of blood ethanol were recorded (Watkins and Adler, 1993).

The presence of food, especially high carbohydrate foods delay gastric emptying, so that an amount of alcohol is oxidized in the stomach by the gastric ADH. This enhanced first pass metabolism reduces the amount of alcohol that finally gets into the blood stream (Seitz, et al., 1993). Since high carbohydrate diets have such tendency to reduce alcohol bioavailability, it therefore, becomes imperative to study the effect of alcohol consumption on α-amylase activity, the enzymic machinery secreted by both salivary and pancreatic glands, involved in the digestion of dietary carbohydrates.

MATERIALS AND METHODS

Experimental Subjects:

Twenty-five male heavy drinkers in apparent sound health were randomly selected as test subjects from the non-smoking alcoholic population. Their average daily consumption was estimated to be 2.15g ethanol/kg body weight, and they have been regular on such daily dose for about seven years. Also, twenty-five age, sex, and weight – matched individuals in apparent health, and who do not smoke or drink alcohol were included as the control subjects.

The subjects were selected from the Urhobo ethnic group in Ethiope East Local Government Area of Delta State. Blood counts, liver function tests and medical examinations were performed to certify the health of the volunteers. The habitual alcohol drinkers consume mostly native liquor (ogogoro) and hot drinks especially in the evenings.

Sample Collection:

Blood and saliva samples were collected in the morning from the selected consenting individuals. The blood samples were collected from the subjects using the vene puncture technique into lithium – heparinized bottles, then centrifuged at 1200 x g for about 5 min at room temperature. The supernatant was thereafter decanted and stored frozen as plasma in bijou bottles.

Saliva samples were collected some few minutes after the blood collection by gangling the mouth with about 5.0ml of clean water for about 3 minutes and thereafter poured into a plain, sterile collection bottle. The plasma and saliva samples were collected within 2 days and stored frozen. They were analyzed within 50h of collection.

Sample assays were again performed after one month using fresh samples collected from the same set of volunteers and the data obtained were expressed as mean ± SD of the two determinations.
Analysis of Plasma and Saliva Samples

The activity values of both plasma and saliva α-amylase were determined by the kinetic enzymatic method of Rauscher, et al. (1985) using freshly reconstituted commercial reagents.

RESULTS AND DISCUSSION

The results are summarized on Table 1.

Table 1: α- Amylase activity in the saliva and plasma of habitual alcohol drinkers.

<table>
<thead>
<tr>
<th>Subject</th>
<th>α-Amylase activity (IU/L)</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Saliva</td>
<td>Plasma</td>
</tr>
<tr>
<td>Control (25)</td>
<td>144.0±8.0</td>
<td>72.5±3.5</td>
</tr>
<tr>
<td>Test (25)</td>
<td>185.0±6.0*</td>
<td>113.5±4.0*</td>
</tr>
</tbody>
</table>

Tabulated values are means ± SD

*Significantly (p<0.05) different from the control value. Numbers of subjects are written in parenthesis.

The mean plasma α-amylase activity value was higher for the test (heavy drinkers) subjects than the control mean value. This difference was demonstrated to be statistically significant at the 5% probability level using the Student’s t-test. Similarly, the mean α-amylase activity value in the saliva of the control subjects was significantly lower than that of the heavy drinkers.

Evidence from this study suggests that alcohol effects on α-amylase and its secreting glands may occur even before the symptoms associated with heavy alcohol drinking become recognizable. This finding might be beneficial in the early detection of alcohol abuse.

Albeit, α-amylase hyperactivity may likely promote alcohol bioavailability by enhancing gastric emptying. Increased bioavailability of alcohol has been reported to enhance the risk of alcohol toxicity in organs mostly involved in its biotransformation (Bora, et al., 1996).

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