

EFFECT OF ALCOHOL DEPENDENCE ON THE LEVELS OF DUODENAL DISACCHARIDASES IN HUMAN SUBJECTS

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Abstract : Background : The aim of the study was to detect the duodenal enzyme activity in patients of alcohol dependence and to compare with non-alcoholic patients of non-ulcer dyspepsia. Methods : Disaccharidases (lactase, sucrase, maltase) were estimated in 20 non alcoholic patients of non-ulcer dyspepsia and 20 alcoholics admitted to the drug de-addiction and treatment centre of PGIMER, Chandigarh, India. Results : No significant influence of alcohol on enzyme levels in patients of alcohol dependence when compared to patients of non-ulcer dyspepsia was observed. However, a significant decrease in lactase level was noted in patients consuming more than 125 gm/day of alcohol. Conclusion : Amount of consumption of alcohol showed decrease in lactase enzyme, but not in maltase and sucrase. There was no effect of duration of alcohol consumption on disaccharidases in the two groups.

Key words : alcohol

disaccharidases

INTRODUCTION

The gastrointestinal tract is directly affected by the ingestion of alcohol as it is prone both to the direct local toxic effects of alcohol and toxic effects produced by the alcohol circulating in the blood stream (1). Adverse effects of alcohol that cause small intestinal dysfunction include increased mucosal permeability, promotion of bacterial overgrowth, altered gut motility and impaired salt and water absorption (1, 2). Alcohol is also known to expose the small intestinal mucosa to oxidative stress (3). Experimental studies have shown structural

changes in intestine with acute and/or chronic effects of alcohol (4, 5) with a view of assessing its effects on intestinal histology, ultra structure and levels of small intestinal enzymes. The diasaccharidase group of enzymes have been of particular interest because of its implications in malabsorptive disorders (6).

Not much work is available on the effect of alcohol on various disaccharidases. Chronic ethanol effects on residual small bowel brush border enzymes after proximal jejunum resection were reported in animal

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model recently (7). Acetaldehyde was shown to alter brush-border enzyme activities in CaCO_2 cell lines (8). Most of the studies with chronic alcohol ingestion have been done on animals and have not been confirmed in humans. Thus, we undertook this study to detect the enzyme activity in patients of alcohol dependence and to compare the enzyme levels with non-alcoholic patients of non-ulcer dyspepsia.

METHODS

In total, 40 patients were enrolled for the present study. The study group comprised 20 patients with alcohol dependence as defined according to the criteria different from that of alcohol abuse (9, 10). The control group consisted of 20 patients of non-alcohol dependent patients of non-ulcer dyspepsia who underwent endoscopy for evaluation of their symptoms as clinically indicated by Soll (10).

Criteria for inclusion in the study group was patients fulfilling the criteria laid down by DSM III R, APA 1987 (9), for alcohol dependence. Exclusion criteria included, alcoholic patients with cirrhosis and portal hypertension, coagulopathy, any drug therapy within two weeks prior to endoscopy, previous bowel surgery, giardiasis proven on stool microscopic and histological examination, tropical and non tropical sprue, inflammatory bowel disease, pancreatic disease, and malignancy.

Patients admitted to the drug deaddiction and treatment centre, PGIMER, Chandigarh in case of study group ($n = 20$) and those attending medical out patient department in the PGIMER, Chandigarh in case of control group ($n = 20$) were taken up for the

study. A detailed history was taken including physical and systemic examination with special emphasis on duration of alcohol intake, amount of alcohol intake, type of alcohol consumed, history of lactose, intolerance, smoking and any medication/therapy.

Patients were kept fasting overnight and informed consent was taken before performing endoscopy using a forward viewing flexible endoscope within a week of admission to the Institute. During endoscopy, a detailed examination of the esophagus, stomach and duodenum was made. Two pairs of biopsy specimens were taken from duodenum. Endoscopist was not aware of the signs and symptoms, or duration of alcohol intake, diagnosis of the patients. The biopsy sample was kept in paraffin and stored at -70°C till the time of enzyme estimation. Activities of the brush border enzymes i.e. lactase, sucrase and maltase were estimated using the method of Dahlquist (11). Proteins were estimated by the method of Lowry et al. (12). Histological examinations were performed with Hematoxylin and Eosin stained tissue sections.

Statistical analysis

The data were analysed using student 't' test (unpaired). Comparison of enzymes in two groups, significance of other factors like amount of alcohol consumption, duration of consumption, smoking, lactose intolerance, duodenal inflammation were also analysed by unpaired 't' test. P value < 0.05 were considered significant. Ethical approval was obtained from the Ethical Committee of Post Graduate Institute of Medical Education and Research before starting the study.

RESULTS

Twenty patients, all males, fulfilling the criteria for chronic alcohol dependence had a mean (\pm S.D.) age of 38.4 ± 5.8 ranging between 28–55 years in the study group. Twenty males fulfilling the criteria for non-ulcer dyspepsia comprising control group had a mean (\pm S.D.) age of 36.6 ± 12.18 years ranging between 18–60 years. All 20 patients were teetotalers and did not give history of alcohol consumption ever in the past.

The duration of alcohol intake ranged from 8 to 34 years (mean \pm S.D., 14.6 ± 6.05) and the amount of alcohol consumed ranged from 62 gm/day to 500 gm/day (mean \pm S.D., 210.8 ± 21.76 gm/day).

Enzyme activities of lactase, sucrase and maltase in human duodenal mucosa were comparable in the two groups (Fig. 1). Five patients consumed alcohol for less than 10 years while 15 patients consumed alcohol for more than 10 years and were designated as Group I and II respectively for further comparison. There was no significant

difference in the intestinal enzymes with respect to duration of consumption of alcohol in the two groups (Fig. 2).

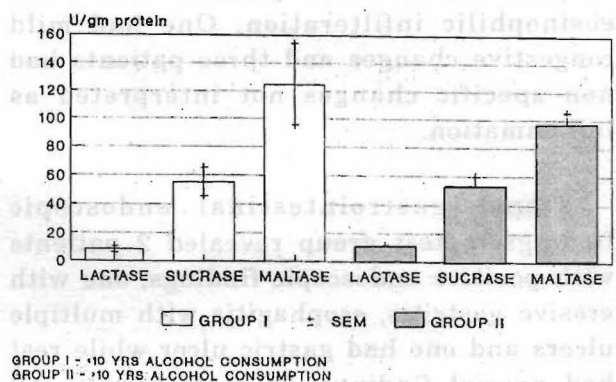


Fig. 2: Enzyme activities in human duodenal mucosa (D2) in patients with alcohol dependence with respect to duration of consumption of alcohol.

Five patients consumed 125 gms or less alcohol/day while fifteen patients consumed more than 125 gms alcohol/day. No statistical significant difference was found to exist between these two groups in case of maltase and sucrase enzymes. However, a significantly ($P < 0.01$) decreased lactase enzyme activity was observed in the group of patients consuming alcohol more than 125 gm/day (Fig. 3).

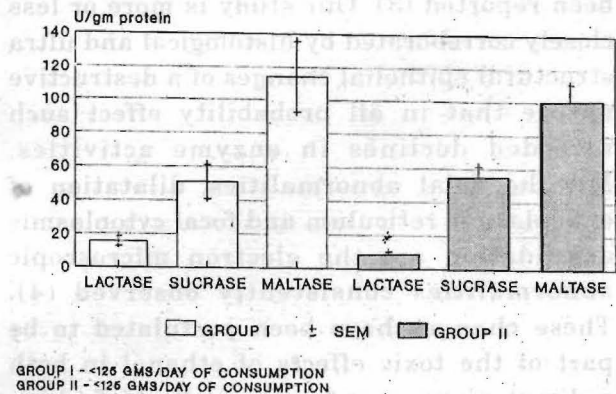


Fig. 3: Enzymes activities in human duodenal mucosa (D2) in patients with alcohol dependence with respect to amount of alcohol consumed in grams per day.

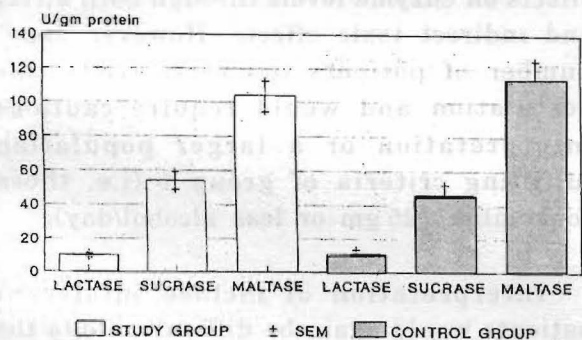


Fig. 1: Enzymes activities in human duodenal mucosa (D2) in study group of alcohol dependent patients and control group of patients of non-ulcer dyspepsia.

Histological characteristics in the study group revealed duodenal inflammation in 15 patients, seven had active and eight chronic forms. One patient had mild eosinophilic infiltration. One had mild congestive changes and three patients had non specific changes not interpreted as inflammation.

Upper gastrointestinal endoscopic findings in test group revealed 2 patients with positive endoscopic findings, one with erosive gastritis, esophagitis with multiple ulcers and one had gastric ulcer while rest had normal findings. In control group all patients had normal findings.

DISCUSSION

There have been conflicting reports of enzyme behaviour in cases of lactase, sucrase and maltase in the intestinal brush border epithelium in laboratory animals subjected to ethanol ingestion, especially in the long term (1, 4). There seems to be little doubt over enzyme activities in animals subjected to acute large doses of alcohol, where depression of enzyme levels have been reported (3). Our study is more or less closely corroborated by histological and ultra structural epithelial changes of a destructive nature that in all probability effect such recorded declines in enzyme activities. Mitochondrial abnormalities, dilatation of endoplasmic reticulum and focal cytoplasmic degradation are the electron microscopic abnormalities consistently observed (4). These changes have been postulated to be part of the toxic effects of ethanol in both a direct manner and in an indirect fashion through blood borne effects which lead on to alter the enzyme activities.

This study reveals that 20 patients of study group when compared with 20 patients of control group (Non-ulcer dyspepsia) did not have statistically significant differences in their enzyme activities. A previous study done in this institute, using same laboratory and thus the same standardisation also did not reveal significant differences in enzyme levels of patients with non-ulcer dyspepsia as compared to healthy controls (13). Our patients of non-ulcer dyspepsia were abstinent and these values paralleled those of the previous study. The results of the present study are consistent with the study of Perlow et al. (14) who found significantly depressed enzyme (Sucrase and lactase) activities in black study population as compared to the black control group of assorted patients with gastrointestinal complaints.

When patients were subdivided in the study group on the basis of amount of alcohol consumed gm/day, the finding could reflect that the amount of alcohol consumed has a direct bearing on the enzyme level of lactase. Greater amounts of alcohol consumed per day may have depressant effects on enzyme levels through both direct and indirect toxic effects. However, small number of patients (n = 5) restricts this postulation and would require cautious interpretation or a larger population fulfilling criteria of group I (i.e. those consuming 125 gm or less alcohol/day).

Interpretation of lactose intolerant patients would again be difficult due to the smaller number of patients (n = 3). Trials with large number of patients are required to come to conclusive interpretation.

On the basis of duodenal histology again the enzyme levels were observed to be non significant in the study group compared to the control group. Similar findings were also reported by Vetvik et al. (15) suggestive absence of significant influence on enzyme levels in patients with duodenal inflammation. Comparison of enzyme levels of study group with non-ulcer dyspepsia patients in relation to endoscopic findings was not possible because of the disparity in

the sample size as there were only two patients with endoscopic findings having erosive gastritis, esophagitis with multiple ulcer and a hiatus hernia.

In conclusion, enzyme activities of brush border were found to be non significant in the alcohol dependence patients when compared to non-ulcer dyspepsia patients in relation to smoking, lactose intolerance, histological and endoscopic findings.

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