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Indices of Alcohol Intake

Comparison between serum concentrations of alkaline phosphatase and gamma glutamyltransferase in middle-aged men

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ABSTRACT

A comparison was performed on the validity of serum-gamma-glutamyltransferase (S-GT) and serum-alkaline phosphatase (S-ALP) concentrations for establishing the increased alcohol intake in a group of middle-aged men in Uppsala. These men were all born in 1915 and were participants of a special health investigation performed at their age of 60 years. Subjects who were registered at the Temperance Board, or had ethyl alcohol in urine or gave a positive reply to a question of alcohol intake were designated alcohol index cases. The mean S-GT values of these different alcohol index groups were significantly higher than that of a randomly selected subgroup devoid of alcohol findings in the same population. No such differences were found when comparing the corresponding mean S-ALP values. The authors thus point to the superiority of S-GT determinations to S-ALP determinations, especially in patients where the alcohol consumption certainly not is to be regarded as excessive.

INTRODUCTION

Use and abuse of alcohol is commonly noted. Excessive chronic alcohol intake is usually followed by grave social and medical maladjustments. In such cases diagnosis of chronic alcoholism is of no problem to the physician. However, early diagnosis of increased alcohol intake, which not yet has caused social and/or physical deterioration is of great value in many clinical situations. Such situations may exist among patients with therapeutic failures, for example in patients with hyperlipidemia, cardiac arrhytmias of unclear origin, and those presenting with various symptoms as low back pains, headache, gastritis and insomnia.

Since ethanol is mainly metabolized in the liver cells it has been appropriate to search for signs of liver damage as an index of excessive alcohol intake. In litterature diverging reports are found (5)(6), concerning the elevation of serum concentration levels of certain enzymes in various degrees of alcohol intake. This study was performed in order to compare the diagnostic value of

determination of serum alkaline phosphatase (S-ALP) and serum gammaglutamyl-transferase (S-GT) in a population of 60-year-old men in Uppsala, investigated in special health survey. The concentrations of the above mentioned enzyme were also related to other parameters of alcohol intake as a positive medical history, occurrence of ethanol in urine or registration at the local Temperance Board, dur to alcohol abuse.

MATERIAL AND METHODS

The actual population consisted of 422 men born in 1915 who were living in the community of Uppsala in 1975. This population was called to a special health investigation and 331 men took part. The participation thus reached 78.4 %. The procedures of this health investigation have been described in detail elsewhere (15). Blood samples were taken in a fasting state. The subjects were asked to fast and to refrain from smoking from midnight prior to the morning of the investigation.

Analysis of S-GT was performed mainly according to the method described by Szasz (11), and analysis of S-ALP was carried out according to the Scandinavian Enzyme Committee (12). Mean values and standard deviation (S.D.) will be given for these analyses. Further all participants were asked to collect all urine voided during the 24 hours following the health investigation. The purpose of this urine collection was not named to the participants. Analysis of ethyl alcohol in urine was performed with an alcohol dehydrogenase method according to Bonnichsen (2). Finally the subjects were asked by a modified self-administered questionnaire after Collen et al. (4), if they had taken any alcoholic drinks the day preceding the health screening. The records of the local Temperance Board were searched prior to the health investigation.

Table 1. Mean values and standard deviations for S-GT and S-ALP in the alcohol index groups and in the control groups. The group sizes are given in subjects per cent.

Groups	Subjects per cent	S-GT µkat/l	S-ALP µkat/l
Total study population		0.26 ± 0.27	2.2 ± 0.66
Alcohol in urine	11	0.32*** ± 0.29	1.9 ± 0.64
Positive Questionnaire reply	14	0.38* ± 0.31	2.3 ± 0.70
Registered at Temp. Board	8	0.33 ± 0.29	2.1 ± 0.53
Control Group	28	0.24 ± 0.28	2.4 ± 0.72

* $p < 0.05$ compared to control group

*** $p < 0.001$ compared to control group

RESULTS

In 28 % of the participants various signs of occasional or long-standing alcohol

intake were noted according to findings of alcohol in urine, positive reply to question on alcohol intake the day preceding screening or registration at the Temperance Board (Table 1). These subjects (n=93) will further be referred to as alcohol index cases. An equally large (n=93) control group was formed among those participants who did not belong to any alcohol index group.

Analysis of S-GT

The distribution of S-GT values in the screened population is shown in Fig 1: The relative number of alcohol index cases increased with the concentration of S-GT (14). Among these subjects who had S-GT values $\geq$ 0.70 µkat/1, 63 % were alcohol index cases compared to 22 % for those who had S-GT values < 0.30 µkat/1. It was also noted (Table 1) that the mean S-GT values of all alcohol index groups were significantly higher than the mean S-GT value of the control group.

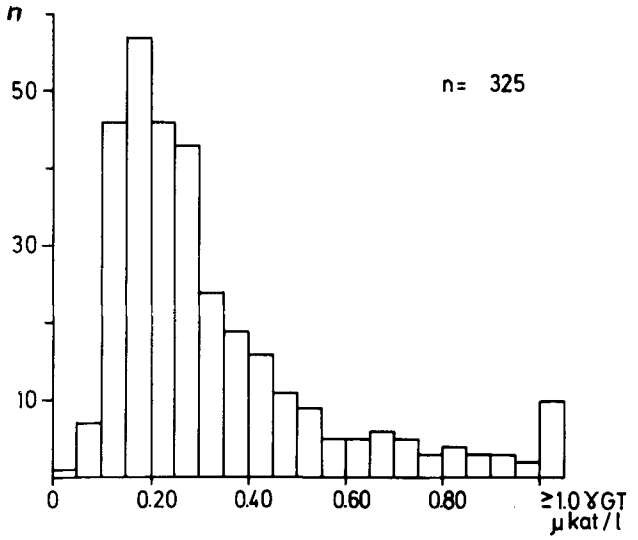

Fig 1. Distribution of serum GT concentrations (in µkat/1) among the whole screened population.

Analysis of S-ALP

It can be seen from Table 1 that the mean values for S-ALP of the entire screened population was 2.2 ± 0.66 µkat/1.

In contrast to the results of the S-GT analysis, the mean values of S-ALP in the alcohol index groups were not significantly different from that of the control group (Table 1). A weak correlation (r=0.27) was found between the corresponding S-ALP and S-GT values.

DISCUSSION

This study was performed in a population which was homogenous concerning age and sex. It consisted of participants of a special health investigation of 60-year-old men in Uppsala.

The aim of this study was to evaluate the diagnostic usefulness of S-ALP and S-GT, with respect ot recent or possibly long-standing alcohol intake. One could certainly assume that the main part of the alcohol index cases. consisted of subjects with a moderate alcohol intake. Some heavy alcohol consumers may be found among the participants, but such individuals are mainly to be found among non-participants of health investigations (13).

Previously performed studies (8)(19), show that S-GT is a discriminatory variable between alcohol consumers and those having little or no alcohol intake. There are, however, relatively few studies relating alchohol intake to serum enzyme levels of S-GT and S-ALP.

Betro et al. (1) showed that among chronic alcoholics the S-GT levels were above the upper normal level among 88 % of the cases, whereas the corresponding figure for S-ALP was 81 %. The same authors discuss the possibilities of S-ALP isoenzyme determinations in cases where a normal S-GT value is found. This was performed in a study by Brohult & Sundblad (3). They studied 16 subjects with a heavy alcohol intake. Their findings indicated normal absolute values of S-ALP. However, the S-ALP alfa-1 isoenzyme fraction was pathologically elevated in 13 of these 16 subjects. Wiseman & Spencer-Peet (16) compared the serum levels of S-GT and S-ALP in two groups of alcohol consumers. Their first group comprised heavy regular drinkers where S-GT levels were pathologically elevated in 75 % of the cases, compared to S-ALP which was elevated in the same manner in only 23 % of the subjects. For occasional drinkers the corresponding figure were 46 % for S-GT and only 8 % for S-ALP. Nearly the same figures were obtained by Patel & O´Gorman (9). Zein & Discombe (17) and van Husen et al. (5) concluded in their studies that determination of S-ALP concentrations are of little value compared to S-GT determinations when diagnosing increased alcohol intake.

Kryszewski et al. (7) studied a population of heavy alcohol drinkers who were hospitalized due to their heavy alcohol intake. Their results showed that 15 days after cessation of alcohol intake, 30 % of the studied subjects had pathologically elevated S-ALP values, as compared to 46 % concerning the S-GT values.

In our study it was possible to relate the S-ALP and the S-GT values to medical history of recent alcohol intake, registration at the Temperance Board and to the occurrence of ethyl alcohol in urine. In none of the above mentioned alcohol index groups the mean S-ALP was pathologically elevated, and thus gave no diagnostic information on alcohol intake, in the same way as did S-GT.

Our study supports the previous works pointing to the diagnostic superiority of S-GT determinations to S-ALP especially when diagnosing moderately increased alcohol intake.

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