EFFECTS OF AGE AND SEX ON BIOCHEMICAL RESPONSES TO DRINKING HABITS

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DRINKING HABITS affect the results of a number of biochemical and haematological tests, even within the range of alcohol consumption which is considered normal. The tests showing significant effects are those measuring plasma gamma-glutamyl transpeptidase level, uric acid level, triglyceride level, and aspartate aminotransferase level, and the erythrocyte mean corpuscular volume. The relationships were different in men and women and significant age differences were found, with few abnormalities being detected even in heavy drinkers aged less than thirty.

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THE STUDY

A recent study[1] of responses to a computer-administered questionnaire revealed that 29% of men and 11% of women attending a multiphasic health screening centre in Sydney (Medicheck) were at risk of physical and/or psychosocial complications because of their alcohol intake. Analysis of biochemical and haematological test results from this population[2] has revealed correlations between these results and both the frequency of drinking and the quantity consumed each time, even within this apparently normal population not overtly suffering from "alcoholism". We have now completed further analysis of this

data and report on the correlation of five test results with the total monthly alcohol intake as calculated from responses to the questionnaire, and on the effects of age and sex on these correlations. We believe in this way it is possible to identify individuals or groups within the population who are showing abnormalities as a result of their drinking.

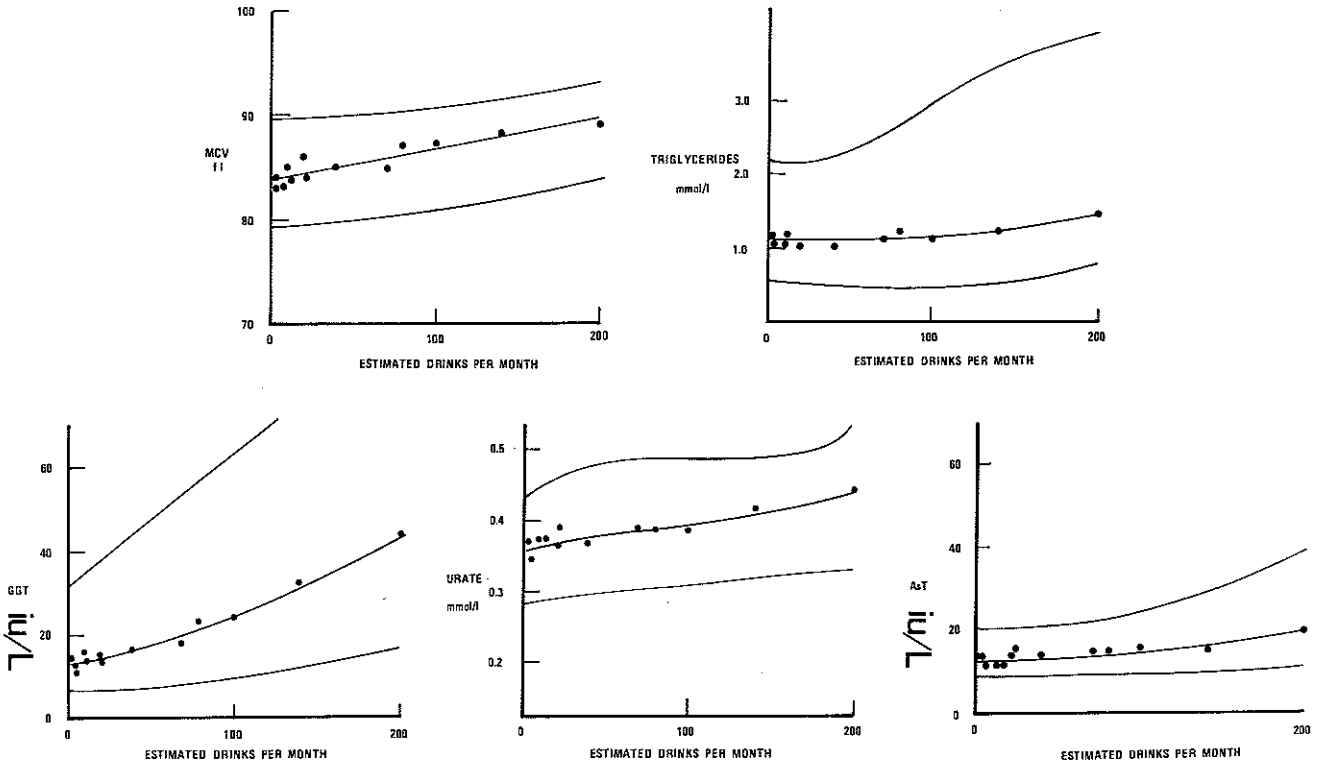

FIGURE 1: Relationship between number of drinks per month (10th, 50th and 90th percentiles) and plasma gamma-glutamyl transpeptidase, uric acid, aspartate aminotransferase, and triglyceride levels and erythrocyte MCV, in 4562 men.

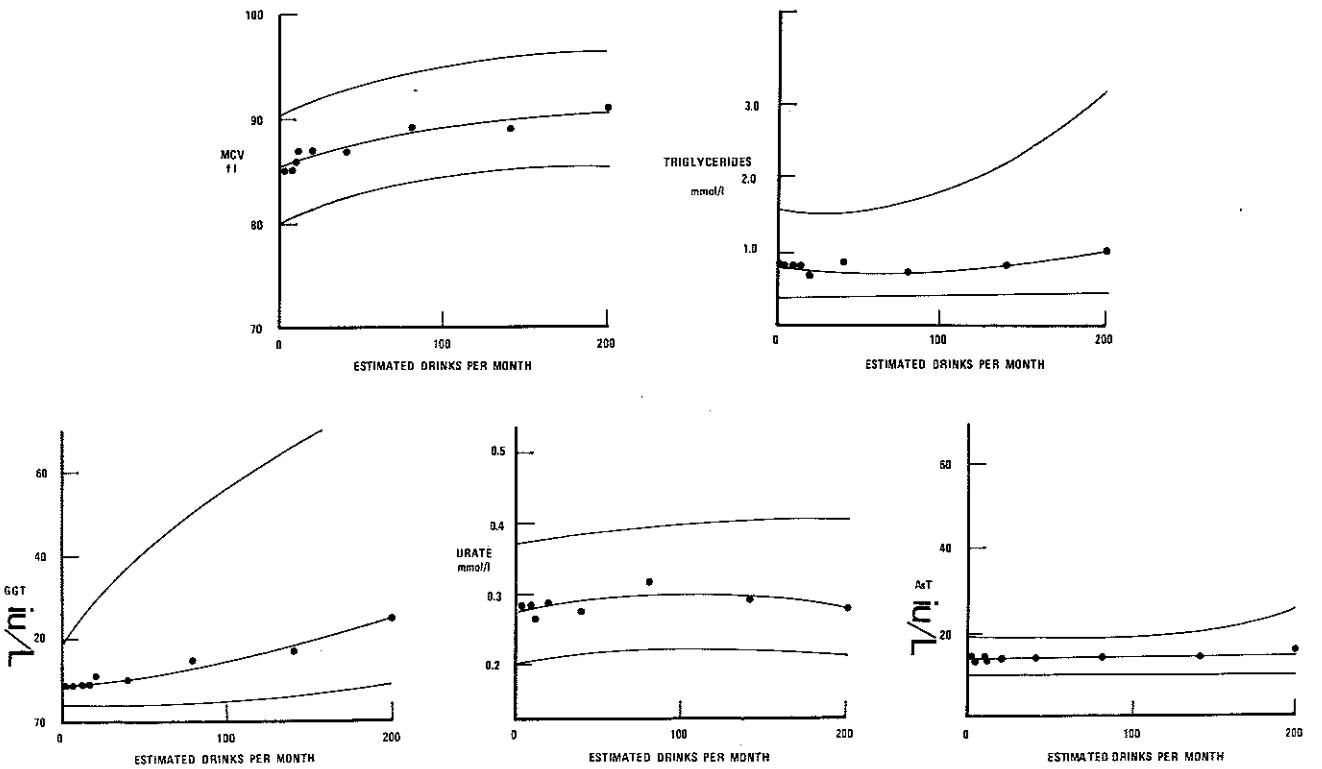

FIGURE 2: Relationships between number of drinks per month (10th, 50th and 90th percentiles) and plasma gamma-glutamyl transpeptidase, uric acid, aspartate aminotransferase, and triglyceride levels and erythrocyte MCV, in 3353 women.

METHODS

The questions from which alcohol intake was estimated are shown in the Appendix: the intake was calculated in terms of drinks per month by multiplying the factors for frequency and habitual quantity of drinking shown in the Appendix.

Further information on Medicheck, the questionnaire, and the drinking habits of the population studied are given in the study previously cited.[1] The biochemical and haematological measurements were made using standard techniques, and the parameters previously shown[2,3] to be most affected by drinking (plasma gamma-glutamyl transpeptidase level GGT; erythrocyte mean corpuscular volume MCV; plasma urate level, UA; plasma triglyceride level, TG; and plasma aspartate aminotransferase level, AST (GOT)) were related to alcohol intake in terms of drinks per month. Out of all male drinkers, approximately 5% took 200 drinks per month,

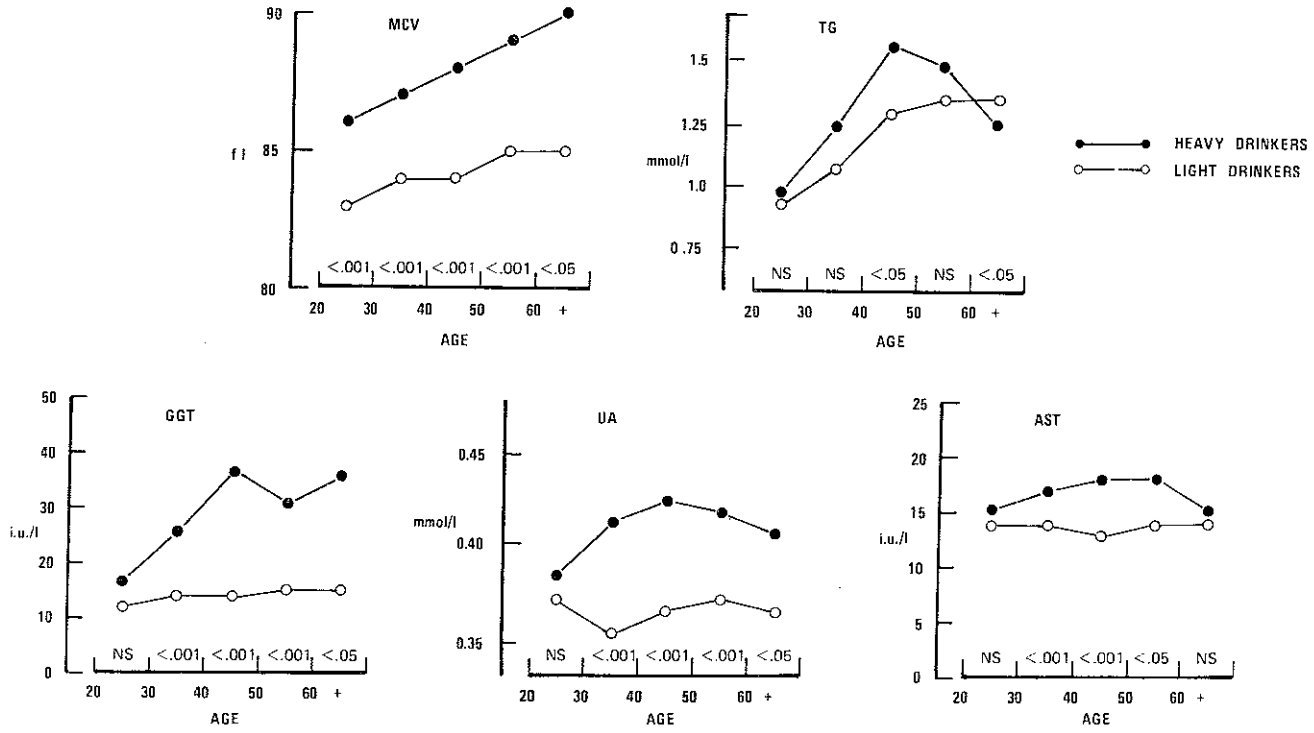

FIGURE 3: Differences in median values between male light and heavy drinkers, showing effects of age.

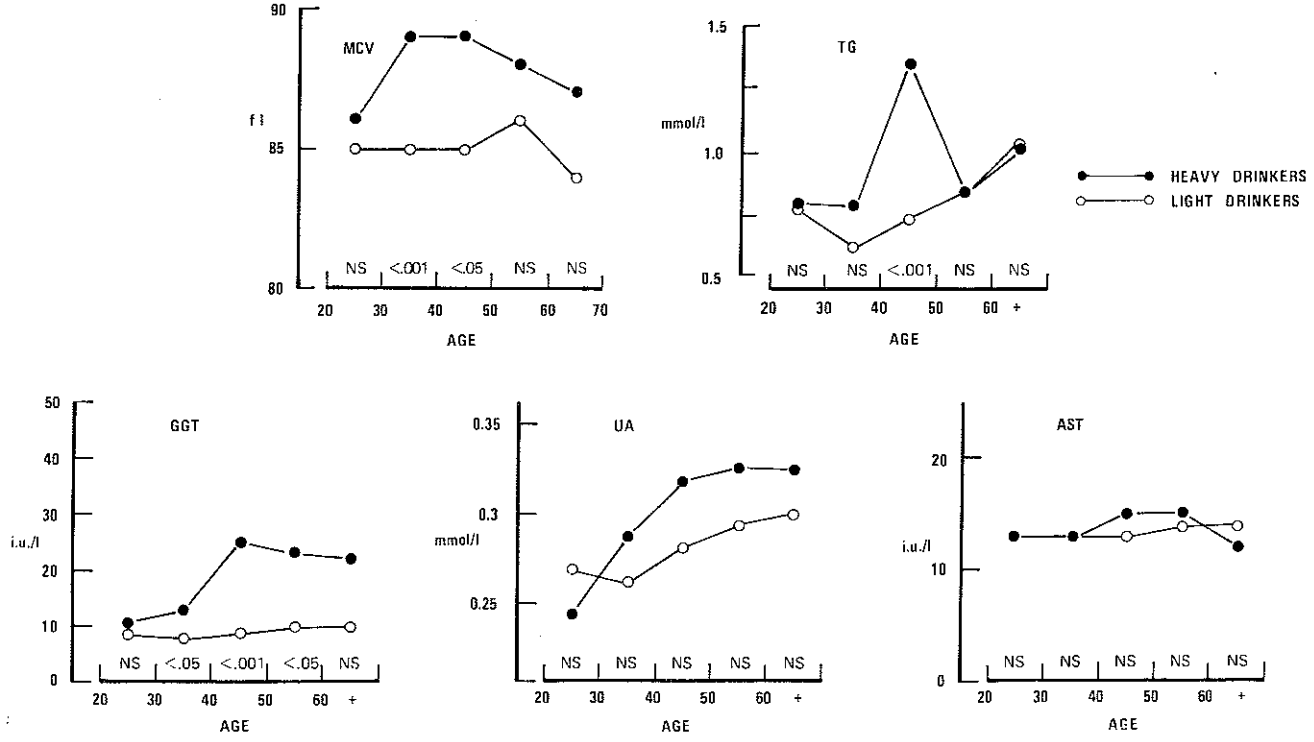

FIGURE 4: Differences in median values between female light and heavy drinkers, showing effects of age.

10% took 100 to 150, 25% took 50 to 100, and 60% took less than 50. Of female drinkers, the proportions were: 200, 0.5%; 100 to 150, 2%; 50 to 100, 15%; and less than 50, over 80%. Because of the non-Gaussian frequency distributions the data are plotted as median, tenth, and ninetieth percentiles instead of the more usual mean and two standard deviations. Results for men and women have been treated separately throughout. From the over-all sample of 7915 individuals (4562 males, median age 46 years; 3353 females, median age 45 years), groups categorized as "light drinkers" and "heavy drinkers" were extracted for investigation of the effects of age. The "light drinkers" had replied that their alcohol intake was in one of the two lower categories for both frequency and habitual quantity, and the "heavy drinkers" gave answers to both questions in one of the two higher categories. This yielded 716 male heavy drinkers, 87 female heavy drinkers, 515 male light drinkers and 446 female light drinkers. These two groups' results were compared for each decade from the third to the seventh, using the chi-square test for significance. In this way the possible effects of age on the results could be eliminated, as each age group of heavy drinkers could be compared with a control group of the same age.

RESULTS

The effects of monthly alcohol intake on the five laboratory test results are shown for men and women in Figures 1 and 2. The lines are computer-generated second-degree polynomials fitted to the tenth, fiftieth and ninetieth percentiles, and the points are the observed values for the fiftieth percentiles (medians). For men, there is an upward trend in all results with increased drinking, and, although the median increases with drinking in all cases, the trend is more evident for the ninetieth percentile for most of the tests. For women, changes are seen for GGT, MCV, and triglyceride, but not for urate and very little for AST. There were few women in the heaviest drinking groups.

In Figures 3 and 4 the changes in median values with age are plotted for light and heavy drinkers, for men and women respectively. In the case of the men, it will be noted that while MCV differed in all age groups the other results did not differ significantly in the 20 years to 30 years age group but differences appeared thereafter. The same is broadly true for women: differences were found in some tests after the age of 30 but never before.

DISCUSSION

Even among the heaviest drinkers, many individuals showed no abnormalities. The reasons why some people do not show changes are unclear: age is certainly one factor, possibly because the effects build up over years of alcohol abuse or possibly because other age-related changes affect the response to heavy drinking. Whatever the reasons, some people show abnormalities while others drinking about the same amount do not. It is tempting to postulate that those people who show biochemical abnormality will later develop the physical consequences of high alcohol intake, but this can only be speculative at present. It seems likely that these results indicate alcohol-induced damage rather than a non-significant response to the presence of ethanol in the body because of the effect of age. Alcoholic liver disease tends to appear only after 10 to 15 years of heavy drinking.[4,5]

These tests could be used to study differences in alcohol intake between groups or changes of alcohol intake within groups with time. For instance, this might be used to evaluate the effectiveness of educational campaigns on the dangers of excessive drinking, or to provide an objective measure of alcohol intake in studies on the effects of personality or environment on drinking. However, the application of these findings to individuals (for example, presymptomatic detection of alcohol abuse) could lead to a number of difficulties. Because of the possibility of false positive results and false negative results such results applied to individual patients should be considered in conjunction with other clinical information, but the test results could be very useful in raising the possibility of dangerous drinking habits.

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APPENDIX

Questions on drinking habits, and scores assigned to answers. The scores on the two questions were multiplied to give an estimate of the number of drinks per month.

In the past year, how often did you drink alcohol?

Every day or most days	(Score 20)
A couple of times a week	(Score 8)
Once every week or two	(Score 3)
Very rarely	(Score 1)

How many drinks (wine, whisky, beer, cocktails and so on) did you usually have on each drinking day in the past year?

Total of 9 drinks a day or more	(Score 10)
6 to 8 drinks a day	(Score 7)
3 to 5 drinks a day	(Score 4)
2 or less drinks a day	(Score 1)

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