

Laboratory Studies in Acute Alcoholics

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Laboratory studies on 109 acutely intoxicated male and female alcoholics admitted to the general medical wards of a community general hospital were undertaken. Initially the program was designed to study the thyroid function of these patients, as a previous report had noted that large numbers of alcoholics were thyroid-deficient. During the study, however, other laboratory examinations, which might be confusing or misleading in alcoholics, were also measured. These additional estimations included the serum glutamic oxaloacetic transaminase (SGOT), the serum cholesterol and the serum amylase. No patients were found to be hypothyroid. The results of the tests indicate the need for caution in interpreting SGOT and serum amylase results in acute alcoholics.

THE incidence of alcoholism in Canada has almost doubled in the past decade.¹ Approximately 2% of the population aged 20 years and over are now considered to be active alcoholics. Although 10% of admissions to mental institutions in Canada are attributable to alcoholism, with or without psychoses,¹ alcoholics also represent a considerable number of admissions to general community hospitals.

A survey of such a general hospital containing 374 beds serving the community of Fort William, Ontario, indicates that from 1.1% to 1.35% of all adult admissions over a four-year period had alcoholism listed as either a primary or a secondary diagnosis. Almost an identical admission rate for alcoholics was noted over the same period of time for the general hospital in the neighbouring community of Port Arthur with a similar population density. A review of admissions to McKellar General Hospital, Fort William, during the period of this study indicates that an additional number of alcoholics have their diagnosis recorded by their attending physicians as "gastritis", "anxiety" or some such obscure term. There is no way of knowing whether these are or are not incorrect diagnoses.

Recently an 18-month survey of acute alcoholic admissions to McKellar General Hospital was undertaken. This was prompted by the fact that general hospitals are making more contact with alcoholics and that acute alcoholic intoxication can affect the results of some common and important laboratory tests. It has been observed by clinicians for many years that many

Des analyses de laboratoire ont été faites chez 109 alcooliques (hommes et femmes) en état d'ébriété aiguë et qui avaient été admis dans les salles de médecine d'un hôpital général. Au début, on avait eu l'intention d'étudier la fonction thyroïdienne de ces malades, un rapport antérieur ayant fait remarquer qu'un grand nombre d'alcooliques étaient des insuffisants thyroïdiens. Au cours de cette étude, on a également procédé à d'autres examens de laboratoire qui risquent d'apporter la confusion et de fourvoyer l'observateur. Ces examens supplémentaires comprenaient la transaminase sérique glutamo-oxalacétique (TSGO), la cholestérolémie et l'amylase sérique. On n'a découvert aucun cas d'hypothyroïdie chez les patients examinées. Il ressort de cette étude qu'il importe de se montrer prudent dans l'interprétation de la TSGO et de l'amylase sérique chez des alcooliques en état d'ébriété.

alcoholics in the withdrawal stage mimic thyrotoxicosis (tremor, sweating, restlessness, tachycardia, diarrhea and high pulse pressure). Therefore, this series was undertaken to test the thesis of Goldberg² who reported in 1960 that 64% of a chronic alcoholic military population were thyroid-deficient in varying degrees. As the McKellar Hospital series progressed, other common laboratory studies, as well as thyroid function studies, were undertaken; these included serum amylase, serum glutamic oxaloacetic transaminase (SGOT) and serum cholesterol.

METHOD

Over an 18-month period, each acute alcoholic patient admitted to the ward service of McKellar Hospital had several or all of the laboratory tests noted in Table I.

TABLE I.

Test	Normal range	Method
Serum cholesterol	150 - 260 mg./100 ml.	Bowman, R. E. and Wolf, R. C.: <i>Clin. Chem.</i> , 8: 302, 1962
Serum amylase	60 - 160 units	Caraway, W. T.: <i>Amer. J. Clin. Path.</i> , 32: 97, 1959
SGOT	10 - 40 units	Babson, A. L. et al.: <i>Clin. Chim. Acta</i> , 7: 199, 1962
PBI	3.5 - 8.0 mg./100 ml.	Barker, S. B., Humphrey, M. J. and Soley, M. H.: <i>J. Clin. Invest.</i> , 30: 55, 1951
Resin-T ₃ (Triosorb)	25 - 35%	

There was no selection of these patients. The author personally attended approximately 50% of the patients studied in this survey. Blood samples were uniformly taken within 24 hours of admission, and all the patients had had substantial amounts of alcohol within the 12 hours before their admission to hospital.

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There were 130 admissions to this series, composed of 23 female and 86 male patients. Over the 18-month period of the study three females were admitted twice each and 14 male patients accounted for 32 admissions. The age span in this group was from 21 to 73 years. The average length of stay for the 130 admissions was 5.7 days, but five patients (owing to medical and surgical complications) stayed a total of 135 days, thereby considerably extending the average stay. If these five complicated cases are removed from the series, then the remaining patients stayed an average of 4.7 days. This figure has been found to be remarkably consistent over the past four years at McKellar General Hospital for the average length of stay of acute alcoholic patients.

RESULTS

The results are summarized by the following figures and comments.

PBI.—Sixteen abnormal results were noted in the 102 patients who underwent this test (Fig. 1). Only one patient in this unselected series showed a result of over 30 $\mu\text{g./100 ml.}$, indicating contamination. There were eight results elevated above normal and eight results below normal.

Resin- T_3 (Triosorb test.)—One hundred and three patients underwent this test and 13 abnormal results were recorded (Fig. 2). Of these abnormal results, 11 were elevated and two depressed.

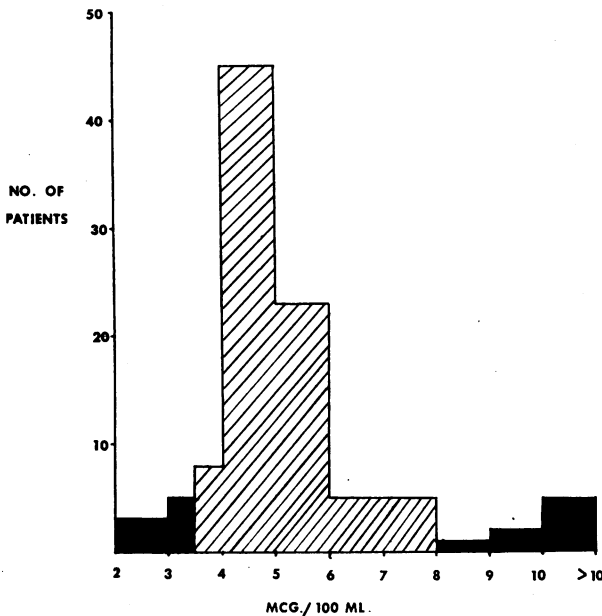


Fig. 1.—PBI results in 102 acute alcoholic patients admitted to McKellar General Hospital over an 18-month period.

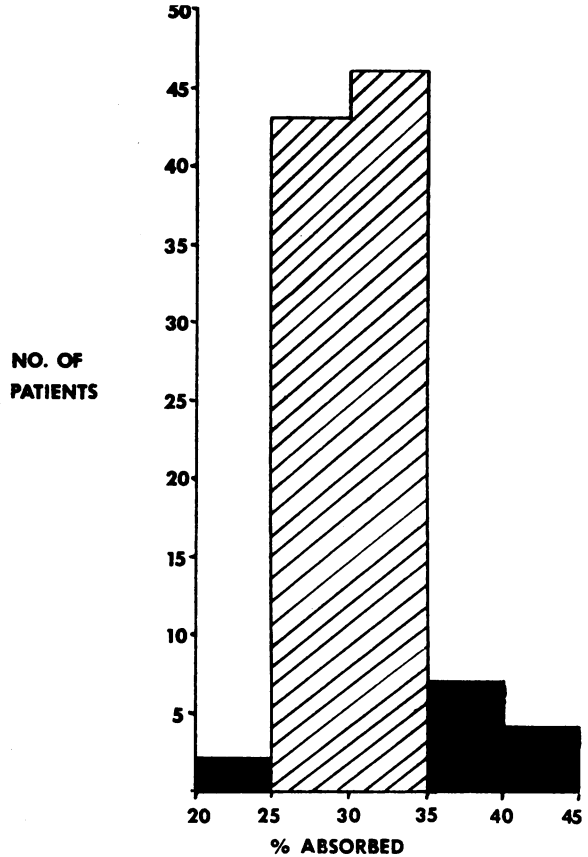


Fig. 2.—Resin- T_3 results in 102 acute alcoholic patients admitted to McKellar Hospital over an 18-month period.

In only one patient were both PBI and resin- T_3 uptake parameters abnormal (resin- T_3 40% and PBI 3.2 $\mu\text{g. \%}$). This case was examined by the author, and no clinical findings were apparent to support a diagnosis of abnormal thyroid function.

Serum cholesterol.—Only 20 estimations were carried out near the end of this study (Fig. 3). Two abnormal results were noted (88 mg. % and 786 mg. %), and in neither case were abnormal results found in the PBI or resin- T_3 tests.

Serum amylase.—All of the 32 patients tested had consumed large amounts of alcohol within the previous 12 to 36 hours. Five tests registered over 160 units (169, 222, 238, 339 and 360 units) (Fig. 4), but as the upper range of

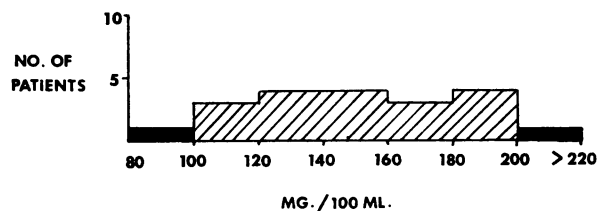


Fig. 3.—Serum cholesterol results in 20 consecutive acute alcoholic admissions.

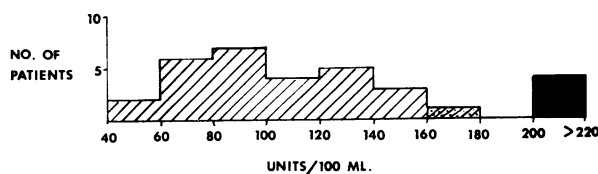


Fig. 4.—Serum amylase results in 32 consecutive alcoholic admissions.

normal for this serum amylase method runs up to 210 units, only the two results in the 300-unit range might have caused confusion with other clinical conditions exhibiting serum amylase elevations.

SGOT.—Within 24 hours of admission, 72 consecutive patients in the middle of the survey were tested, and 43 elevations noted (Fig. 5). Results over 100 units were found in 18 of the patients tested.

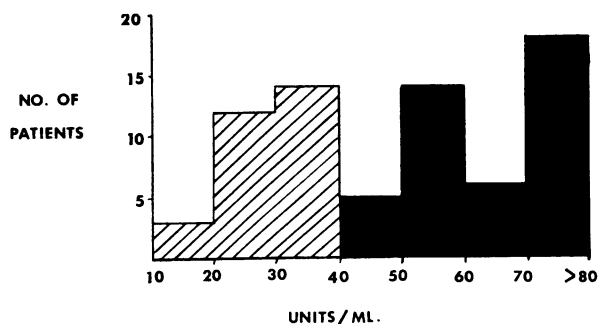


Fig. 5.—SGOT results in 72 consecutive alcoholic admissions.

DISCUSSION

The results of this unselected survey of acute alcoholics admitted to the ward service of McKellar General Hospital did not show any consistent thyroid functional abnormality as measured by PBI and resin- T_3 testing. Rives, Furth and Becker³ have shown that evaluation of thyroid function by the use of PBI technique is a reliable index, especially when testing for hypothyroidism.

There were no findings in this series to confirm the high incidence of thyroid deficiency noted by Goldberg,^{2, 4} Anderson *et al.*⁵ have long suspected, but never proved, that many alcoholics have deficiency of their adrenal cortical function. Attempts by them to show autoimmune mechanisms involving the adrenal gland in chronic alcoholics have, as yet, been unsuccessful. Goldberg⁴ has also suggested that autoimmune mechanisms might curtail the function of the thyroid gland in chronic alcoholics and thus explain the results of his earlier series.² The results of the McKellar Hospital series give no support to Goldberg's theory, as none of the

unselected alcoholic patients appeared to be thyroid-deficient. Although alcohol might alter the hepatic handling of thyroxine, there does not appear to be any chemical basis for the suggestion that alcohol could block thyroid uptake or thyroid hormone production in the human body.

Selzer and Van Houten⁶ recently reviewed 22 consecutive male alcoholic admissions and matched them with 21 control subjects. They could detect no evidence of thyroid deficiency in their alcoholic patients. Three of their alcoholic patients had PBI levels of just under 4.0 $\mu\text{g. \%}$ on admission, when they were in an acutely intoxicated state. When retested one week later, all three patients had normal PBI tests. These three patients in their series had no other criteria of hypothyroidism. Of the eight patients in the McKellar Hospital series with PBI results below normal, none had clinical evidence of hypothyroidism or abnormal resin- T_3 tests.

Goldberg, Hehir and Hurowitz⁷ also attempted to show that the use of intravenous triiodothyronine in acute alcoholic intoxication could shorten the recovery period in alcoholics being withdrawn from alcohol. However, Kalant and his group⁸ were unable to reproduce Goldberg's findings when applied on a double-blind study of 29 volunteers. Kalant could find no marked improvement in blood alcohol disappearance or card-sorting and letter-marking tests in the group receiving intravenously 200 $\mu\text{g.}$ of triiodothyronine, 100 $\mu\text{g.}$ of triiodothyronine or a control solution containing no drug.

With the recognized high incidence of alcoholism in the adult population of North America, it is becoming increasingly important to differentiate the various clinical and laboratory states, other than thyroid disturbance, that alcoholism can closely mimic. Abdominal pain in alcoholics frequently causes confusion and uncertainty of diagnosis. This is especially true if it is coupled with fever, an enlarged and tender liver, jaundice, hemolytic anemia, elevated blood lipids and raised serum cholesterol, as occasionally found in acute alcoholics. Only one of 20 patients tested in the McKellar series showed an elevation of the serum cholesterol considered to be in the hyperlipemic range. The serum amylase test was noted to be only moderately elevated in five of the 32 acute alcoholics tested. The limited results in this series suggest that high serum amylase results in an alcoholic (in the range of 600 to 1000 units) support a diagnosis of pancreatitis, and are unlikely to be caused by the ingestion of alcohol alone.

Bang *et al.*⁹ and others¹⁰ have shown that

SGOT and serum glutamic pyruvic transaminase (SGPT) blood levels correlate closely with liver cell necrosis and cell damage observed at autopsy. Bang and his colleagues were able to show direct toxic effects of alcohol in single moderate doses given to chronic alcoholics, as demonstrated by a rapid rise of SGOT and a later but more prolonged rise in SGPT. Normal subjects given the same dose of alcohol showed no elevation in these serum enzymes. Even after chronic alcoholics had been on an adequate diet for five weeks, reproduction of the SGOT levels in Bang's series remained elevated for a few hours to 11 days, the average case showing an elevation of the SGOT level lasting four days, following acute alcoholic ingestion. No increase in adrenal cortical output on moderate prolonged doses of alcohol could be demonstrated in this series, but Bang and his group felt that rapid ingestion and large doses of alcohol did cause a stimulation of the adrenal cortex and an increase in hydrocortisone output due to stress.

In a large series of chronic alcoholics studied by Hed,¹¹ no correlation between SGOT and blood alcohol levels was noted. He also confirmed that the SGOT rose more quickly, in a more uniform but less sustained manner, than SGPT levels. Hed found elevated SGPT levels persisting up to three weeks after acute alcohol ingestion in chronic alcoholics.

Although slightly over one-half of the patients in the McKellar General Hospital series showed elevations of SGOT above normal, only 18 had levels over 100 units. It would therefore seem that SGPT levels would be more meaningful in following hepatic damage in alcoholics, although it has been noted¹¹ that some acute alcoholics can show calf muscle necrosis with elevated SGOT and SGPT patterns which may confuse the validity of these enzyme studies in acute alcoholics. Differentiation of possible cardiac damage in an alcoholic may also be difficult if great

reliance is placed on these blood enzyme studies alone.

Many alcoholics still pass through our general hospitals undiagnosed and perhaps unrecognized. It is important to be alert to less well-recognized complications of alcoholism such as hypoglycemia, tuberculosis, withdrawal seizures, fractures and peptic ulcers. More recently, attention has been drawn to serious cardiac complications of chronic alcoholism.^{12, 13}

SUMMARY

A biochemical study involving 109 acutely intoxicated patients representing 130 admissions to the public ward service of McKellar General Hospital in Fort William, over an 18-month period, has been carried out. The tests administered included PBI, resin-T₃, serum cholesterol, serum amylase and SGOT. No patients were found to be hypothyroid. The literature has been reviewed in relation to these tests in alcoholic patients.

It is important to realize that alcoholics make up at least 2% of the general adult population and general hospital admissions. These patients are prone to a number of medical and surgical complications and frequently exhibit abnormal laboratory tests.

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