ORIGINAL RESEARCH

Carbohydrate Deficient Transferrin (CDT) as a sensitive marker to diagnose alcohol abuse

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ABSTRACT

Background: In India, alcoholism is a severe problem, with a prevalence of 19–34% on average over a 12-month period. Alcoholics can return to normalcy with early discovery, appropriate medicine, and counseling, but they frequently cleverly conceal their illness and see doctors much later, which has serious socioeconomic repercussions.The present study assessedusefulness of Carbohydrate Deficient Transferrin (CDT) as a sensitive marker to diagnose alcohol abuse. **Materials & Methods:** 45 alcoholics of both genders were selected. Group I comprised of alcoholics and group II had control. Liver function tests and Carbohydrate Deficient Transferrin was assessed. **Results:** In group Iand group II, meanplasma glucose level was 104.2mg/ dl and 106.3mg/ dl, AST level was 42.5IU/L and 32.5IU/L, ALT was 29.6IU/L and 21.9IU/L, ALP was 152.3IU/L and 140.6IU/L, T. PROTEINS (g%) was 6.8 and 6.6, albumin (g%) was 3.2 and 3.1, total bilirubin was 0.8mg/dl and 0.7mg/dl, MCV was 106.4fL and 94.2fL, GGT was 58.2U/L and 24.7U/L, CDT was 5.6% and 1.8% respectively. The difference was significant (P< 0.05).Sensitivity, specificity, PPV and NPV for CDT was 85%, 93%, 94% and 81%, for GGT was 65%, 73%, 78% and 69%, for AST was 68%, 80%, 76% and 72%, for ALT was 34%, 91%, 80% and 69% and for MCV was 49%, 53%, 56% and 58% respectively. **Conclusion:** CDT is a sensitive biomarker that is better than GGT in terms of both sensitivity and specificity and can be used to identify alcohol abuse.

Keywords: Alcoholics, Carbohydrate deficient transferrin, Sensitivity

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INTRODUCTION

In India, alcoholism is a severe problem, with a prevalence of 19–34% on average over a 12-month period.[1] Alcoholics can return to normalcy with early discovery, appropriate medicine, and counseling, but they frequently cleverly conceal their illness and see doctors much later, which has serious socioeconomic repercussions.[2] Furthermore, people may give false answers to the questionnaires that are frequently used to identify alcohol abuse. Therefore, a particular assay process is required to identify alcoholics at an early stage so that appropriate treatment can be started.[3,4]

Although it is often known that alcoholism causes alterations in MCV and liver enzymes (AST, ALT, and ALP), elevated blood levels of these markers are not unique to the illness.[5] Although GGT is a widely used test and has been shown to be a marker for alcohol misuse, research has shown that it lacks specificity in identifying alcoholism because it is elevated in other illnesses such as hepatocellular cancer and phenytoin. Few investigations have found that GGT has a low sensitivity.[6]It has been discovered that the transferrin percentage (%CDT) is unique to alcohol consumption. A type of single-chain glycoproteins that bind iron is known as transferrins. A single polypeptide chain, two iron binding sites, and two N-linked complex glycan chains make up their three substructural domains. The negatively charged sialic acid molecule marks the end of the N glycan chains.[7] A transferrin chain can include anywhere from zero to eight sialic acid molecules, resulting in different isoforms of the protein. Asialo and mono sialo forms of transferrin are not found under normal circumstances, however di-sialo and hepta-sialo forms occur. Glycosyl transferase activity is inhibited and sialidase activity is increased in alcoholics by ethanol and acetaldehyde.[8]The present study assessedusefulness of Carbohydrate Deficient Transferrin (CDT) as a sensitive marker to diagnose alcohol abuse.

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MATERIALS & METHODS

The study was carried out on 45 alcoholics of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Diagnosis of Alcohol abuse was established using AUDIT questionnaire. Group I comprised of alcoholics and group II had control. 3 ml of whole blood samples, 1 ml of Sodium fluoride sample and 2ml of EDTA samples were collected from both the groups. The Trans Asia XL-300 completely automated analyzer was used to perform liver function testing, including GGT and blood glucose tests. Turbidimetric Immuno Assay (TIA) with column separation and turbidimetric measurement by ELISA technique was used to assess the percentage of Carbohydrate Deficient Transferrin (%CDT). The relative amount of %CDT in relation to the total transferrin in unfractionated serum (% CDT) was assessed. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Baseline characteristics

Parameters	Group I	Group II	P value
Plasma glucose (mg/ dl)	104.2	106.3	0.15
AST (IU/L)	42.5	32.5	0.01
ALT (IU/L)	29.6	21.9	0.03
ALP (IU/L)	152.3	140.6	0.02
T.PROTEINS (g%)	6.8	6.6	0.27
Albumin (g%)	3.2	3.1	0.62
Total bilirubin (mg/dl)	0.8	0.7	0.94
MCV (fL)	106.4	94.2	0.05
GGT (U/L)	58.2	24.7	0.02
CDT(%)	5.6	1.8	0.01

Table I, graph I shows that in group I and group II, meanplasma glucose level was 104.2mg/ dl and 106.3mg/ dl, AST level was 42.5IU/L and 32.5IU/L, ALT was 29.6IU/L and 21.9IU/L, ALP was 152.3IU/Land 140.6IU/L, T. PROTEINS (g%) was 6.8 and 6.6, albumin (g%) was 3.2 and 3.1, total bilirubin was 0.8mg/dl and 0.7mg/dl, MCV was 106.4fL and 94.2fL, GGT was 58.2U/L and 24.7U/L, CDT was 5.6% and 1.8% respectively. The difference was significant (P< 0.05).

Graph I Baseline characteristics

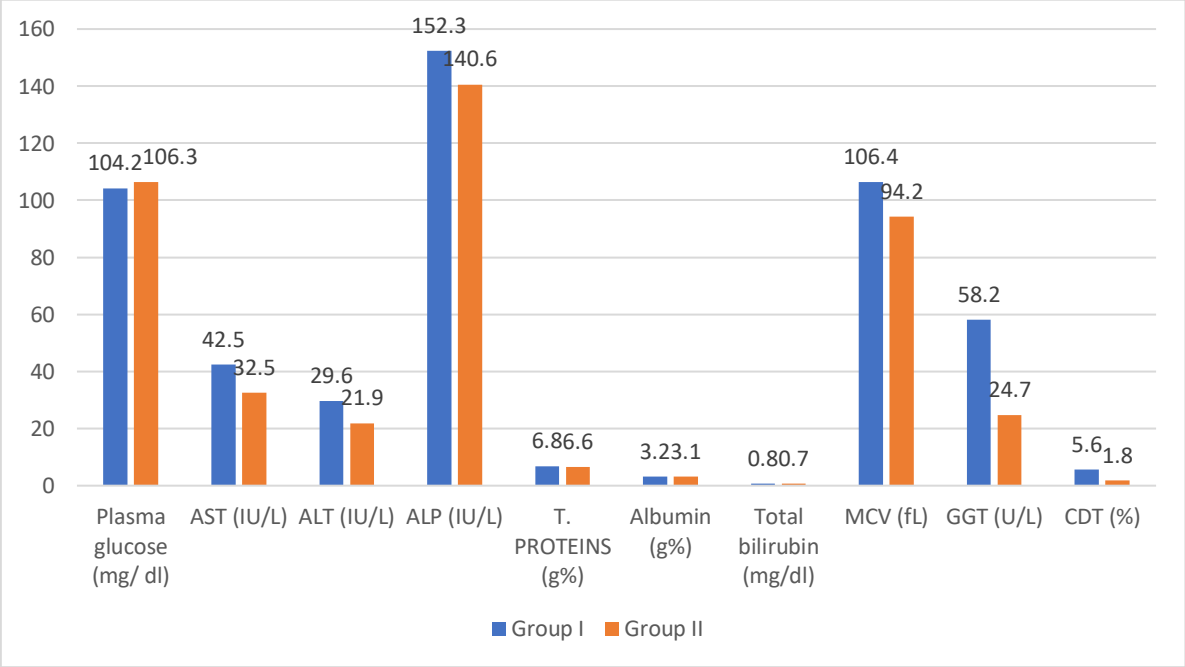

Table II Sensitivity, specificity, PPV and NPV of study parameters

Parameters	CDT	GGT	AST	ALT	MCV
Sensitivity	85%	65%	68%	34%	49%
specificity	93%	73%	80%	91%	53%
PPV	94%	78%	76%	80%	56%

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NPV	81%	69%	72%	69%	58%

Table II shows that sensitivity, specificity, PPV and NPV for CDT was 85%, 93%, 94% and 81%, for GGT was 65%, 73%, 78% and 69%, for AST was 68%, 80%, 76% and 72%, for ALT was 34%, 91%, 80% and 69% and for MCV was 49%, 53%, 56% and 58%respectively.

DISCUSSION

Carbohydrate-deficient transferrin (CDT) is a biomarker for chronic alcohol intake of more than 60 g ethanol/d. It has been reported to be superior to conventional markers like gamma-glutamyltransferase (GGT) and mean corpuscular volume MCV).[9,10]The present study assessed usefulness of Carbohydrate Deficient Transferrin (CDT) as a sensitive marker to diagnose alcohol abuse.

We found that in group Iand group II, meanplasma glucose level was 104.2mg/ dl and 106.3mg/ dl, AST level was 42.5IU/L and 32.5IU/L, ALT was 29.6IU/L and 21.9IU/L, ALP was 152.3IU/L and 140.6IU/L, T. PROTEINS (g%) was 6.8 and 6.6, albumin (g%) was 3.2 and 3.1, total bilirubin was 0.8mg/dl and 0.7mg/dl, MCV was 106.4fL and 94.2fL, GGT was 58.2U/L and 24.7U/L, CDT was 5.6% and 1.8% respectively. Madhubala et al[11]evaluated the usefulness of Carbohydrate Deficient Transferrin (CDT) as a sensitive marker to diagnose alcohol abuse. Twenty-five known male alcoholics who attended to the OPD (Out Patient Department) of Alcohol de-addiction centre of a tertiary care hospital were selected as cases. All of them were diagnosed to have a strong likely hood of hazardous alcohol consumption based on 'Alcohol Use Disorders Identification Test" (AUDIT) questionnaire. Twenty- five age matched, gender matched healthy individuals who were teetotalers were selected as controls. They scored zero in AUDIT questionnaire. The following tests were done: Liver function tests including Serum Bilirubin, Total Proteins, Aspartate Amino Transferase (AST), Alanine Amino Transferase (ALT), Alkaline Phosphatase (ALP), Gamma Glutamyl Transferase (GGT) and Blood glucose levels were estimated using a fully automated biochemistry analyser, XL – 300 (Trans Asia Biomedical systems) and Mean Corpuscular Volume (MCV) was done using an automated hematology analyser Sysmex KX-21. Percentage of Serum Carbohydrate Deficient Transferrin (%CDT) was assessed using immuno Turbidimetric assay, ELISA method (iMark, Bio-Rad Laboratories,). There was a statistically significant difference in values of AST, ALT, ALP, MCV, GGT and % CDT in cases as compared to controls. ROC curves drawn to assess the sensitivity and specificity of each parameter showed that %CDT has the highest sensitivity and specificity (84% and 92% respectively) and MCV (48% and 52% respectively) had the least. GGT when compared to % CDT had a lower sensitivity and specificity (64% and 72% respectively).

We found that sensitivity, specificity, PPV and NPV for CDT was 85%, 93%, 94% and 81%, for GGT was 65%, 73%, 78% and 69%, for AST was 68%, 80%, 76% and 72%, for ALT was 34%, 91%, 80% and 69% and for MCV was 49%, 53%, 56% and 58% respectively. Glutamyltranspeptidase (GGT) and mean corpuscular volume (MCV) assays are commonly used for the biological diagnosis of alcoholism. But because of their poor sensitivity and specificity, researchers are now looking for other, more trustworthy metrics. Alcoholic individuals have higher levels of desialylated transferrin (also known as carbohydrate-deficient transferrin, or CDT), according to Stibler.[12] A serum CDT concentration of less than 60 mg/liter is considered normal; a concentration between 60 and 100 mg/liter suggests probable alcoholism, and a concentration greater than 100 mg/liter suggests a very high probability of alcoholism (specificity: 99%). It has a sensitivity of 60 to 91% and a specificity of 92 to 100%. It lasts for 17 +/- 4 days. Therefore, CDT is a valuable laboratory marker; yet, compared to GGT, its test is more expensive and complicated. Thirty-one DSM-IV alcohol-dependent patients with normal GGT levels are the subject of this investigation. It assesses CDT on day 0 and its progression following a withdrawal of 15 days. MCV and GGT were measured simultaneously. Surprisingly, the data indicate a specificity of 92.2 and a sensitivity of 83.9 (26 positives of 31) in this population. Following a 15-day abstinence, the CDT fell by 36%. For the diagnosis and follow-up of alcoholics with normal GGT levels, CDT is therefore a particularly helpful measure.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that CDT is a sensitive biomarker that is better than GGT in terms of both sensitivity and specificity and can be used to identify alcohol abuse.

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