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Original Research Article

Serum Electrolytes and Hepatic Enzymes Level in Alcohol Withdrawal Patients with and Without Delirium Tremens - A Comparative Study

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ABSTRACT

Background: Delirium Tremens (DTs) is an emergency situation with high mortality rate in alcohol withdrawal patient. Despite in an era of intensive care and advanced pharmacotherapy, the current mortality in patients with DTs ranges from 5-15 % due to respiratory failure and cardiac arrhythmias.
Aims and objectives-
To estimate and compare the Level of serum ions (Na^+, k^+,Mg^{2+},Cl-) and hepatic enzymes (ALT, AST, GGT) in alcohol withdrawal patients with and without delirium tremens.
Methods: A prospective cross sectional study was conducted for a period of one year from July 2013 to July 2014 at department of psychiatry, Assam medical College Hospital. 50cases of alcohol withdrawal with Delirium tremens (F 10.4) and 50 cases without DT (F10.3) were studied from the same socio-cultural background after ethical clearance from institutional review board. Diagnosis of alcohol withdrawal (F10.3) and DT (F10.4) were confirmed both clinically, using ICD-10 and patients were evaluated using Clinical Institute Withdrawal Assessment of Alcohol Scale, Revised (CIWA-Ar). Clinical and investigation details were studied with the help of advanced clinical biochemistry Laboratory, Assam medical college hospital.
Results-1.Significant difference ($p<0.05$) of serum K+ and Mg++ is found in DT group (F 10.4)
Hepatic enzymes AST and GGT is also changed significantly ($p<0.05$) in DT group (F10.4) than the non DT alcohol withdrawal (F 10.3) group.
Conclusion: Patients with Delirium tremens have a significant hypokalemia, hypomagnesemia and deranged levels of hepatic enzymes than F 10.3 group.

Key words: Mortality of delirium tremens, serum ions, hepatic enzymes.

INTRODUCTION

[1] The increasing production, distribution, promotion and easy availability of alcohol coupled with the changing values of society has resulted in alcohol-related problems emerging as a major public health concern in India. The harmful use of alcohol results in approximately 2.5 million deaths each year. (WHO, 2004a). [2] Alcohol withdrawal is a clustered symptom, severity occurring on absolute or relative withdrawal after repeated and usually prolonged use of alcohol. Onset and course are time limited and are related to the dose being used immediately before abstinence. Unplanned alcohol withdrawal may be precipitated, as patient may be admitted for another reason. An alcohol withdrawal patient may present cluster of symptoms with or without delirium tremens. [(3)]

1. Minor withdrawal symptoms (Insomnia, tremor, agitation, Nausea and vomiting, headache, excessive Sweating, palpitations, Craving for alcohol) can appear 6-12 hours after alcohol has stopped.
2. Alcoholic hallucinosis (visual, auditory, or tactile hallucinations) generally appear 12-24 hours after alcohol has stopped
3. Withdrawal seizures (generalised tonic-clonic seizures) can appear 24-48 hours after alcohol has stopped.
4. 'Delirium tremens' (can appear 48-72 hours after alcohol cessation) is manifested by global confusion, agitation, disorientation, hallucination, hyperthermia, hypertension and sympathetic overdrive which can progress to cardiovascular collapse. These symptoms have its highest intensity on the 4th or 5th day, characteristically worse at night. It is an emergency situation, making early recognition and treatment essential. In this modern era of intensive care and advanced pharmacotherapy, despite appropriate treatments, the current mortality for patients with DTs ranges from 5-15%. The most common conditions leading to death in patients with DTs are respiratory failure and cardiac arrhythmias. [3]

Pathophysiology Of alcohol withdrawal insisted on the effect of alcohol on inhibitory gamma amino butyric acid (GABA) receptors. Constant consumption of alcoholic beverages causes down regulation of these GABA, as well as an up-regulation in the production of excitatory neurotransmitters, primarily glutamate, and also nor epinephrine, dopamine, epinephrine, and serotonin, all of which increases the drinker's tolerance to alcohol. [4] On alcohol cessation, these down-regulated $GABA_A$ receptor complexes are so insensitive to GABA that sympathetic activation is unopposed. This "adrenergic storm"; include tachycardia, hypertension, hyperthermia, hyperreflexia, diaphoresis, cardiac arrhythmia, panic attacks, paranoia, and agitation. This is all made worse by up-regulation of excitatory neurotransmitter, serotonin, nor epinephrine, dopamine, epinephrine, glutamate and associated Excitatory N-methyl-D-aspartate (NMDA) receptors, contributing to the delirium and neurotoxicity. [4]

Different HEPATIC ENZYME represents as a marker for different pathological Hepatic status. Elevated Aspartate aminotransferase (AST) are observed in parenchymal liver injury. [Normal AST---15-37 IU/l]. Alanine transaminase (ALT) is elevated in hepatic inflammation, either due to injury or disease process, [Normal ALT—30-65 IU/l]. High levels of Gamma glutamyl transpeptidase/ transferase (GGT) indicates cholestatic damage or alcohol toxicity [Normal value of GGT- 8-85 IU/l].A rise in AST and ALT could indicate alcoholic hepatitis or cirrhosis of the liver.

SERUM ELECTROLYTES variation during alcohol withdrawal is still poorly understood. Homeostasis of Serum Sodium [Normal serum Na+ = 135-155 meq/l] is maintained by antidiuretic hormone, aldosterone, atrial natriuretic peptide and renal hemodynamic factors. In decompensated hepatic status, arterial pressure decreases, which leads to an increase in (ADH) receptor activity, plasma catecholamine, aldosterone, and renin-angiotensin system causing sodium and water retention. [5] Hyponatremia occurs from a reduction in filtered sodium, an increase in sodium reabsorption in the proximal tubule, and a reduction in free water clearance. [6] Serum Potassium [Normal reference value --3.5-5.5 meq/l] mostly as intracellular ion is important in determining the cellular membrane potential as small changes in the extracellular potassium level can have profound effects on the function of the cardiovascular as well as neuromuscular systems. Hypokalemia can exacerbate hepatic encephalopathy by increasing renal ammonia genesis and systemic ammonia levels. Chloride [Normal

reference value. =98-106 meq/l] is an extracellular anion, plays an important role in maintaining normal acid-base, water balance and serum osmolality. Alcohol acts as agonist on GABA-A receptor complex sites and increases Cl- ion influx. In the Alcohol Withdrawal State, sudden cessation of alcohol leads to altered function of GABA receptor complex, leads to decrease cl- ion influx and hyper excitability. [7] Serum Magnesium [Normal reference value=1.3-2.5 meq/l] along with potassium is a major intracellular cation. Hypomagnesemia noticed with malnutrition in chronic alcoholic patients, who typically have poor nutritional intake, decreased pancreatic function, polyuria and increased GI losses. Mg^{++} keeps excitatory N-methyl-D-aspartate (NMDA) receptor in resting state by preventing the effect of glutamate and glycines and not allowing the channel to open. In order to open the channel, depolarisation must remove Mg^{++} on the ligand–gated ion channel complex while both Glutamate and Glycine are bound to their sites. [7,8] In alcohol withdrawal state NMDA receptors are up-regulated, contributing to the delirium and neurotoxicity is noticed.

Thus, understanding the hepatic enzymes and serum ions is important in comprehensive care of the patients with alcohol withdrawal. According to national household survey (NHS), held in 2004, the prevalence of alcohol in India is 21.4%, regional variation of alcohol abuse is seen highest in north east belt of India. [3] Among patients with alcohol dependence treated in psychiatric hospitals, the annual prevalence of delirium was 4.9–7.4%, while in alcohol treatment settings it is 5–15%. [3] With the above background, the present study aimed to study serum ions and hepatic enzymes level in patient with delirium tremens and patient with non delirium alcohol withdrawal patient.

AIMS AND OBJECTIVES

To estimate and compare the Level of serum ions (Na^{+}, k^{+},Mg^{2+},Cl-) and hepatic enzymes (ALT, AST, GGT) in alcohol withdrawal patients with and without delirium tremens

STUDY DESIGN: The study was a cross sectional study

The study was carried out in the department of psychiatry, Assam Medical College and` Hospital, Dibrugarh, Assam after the ethical approval from the institutional review board and a written consent was obtained from every participant or their proper attendents. The study duration was of one year from August 2013 to July 2014.

SAMPLE-They were taken serially from patients that were admitted during the one year period in psychiatry dept drug deaddiction center, Assam medical college, in drug naive state, who fulfilled the inclusion criteria. Those patients who were diagnosed as cases of ALCOHOL WITHDRAWAL but not in delirium tremens [i.e. Non DT (F10.3)] forms group A. The total number of cases was 50 in this group. GROUP B is composed of ALCOHOL withdrawal patients with Delirium Tremens [DT Group (F10.4)] and number of cases in this groups are 50.

Inclusion criteria-- Patients of age group between 18-65 years, of both sexes giving written informed consent[or consent by proper attendant] for the study, diagnosed cases of alcohol withdrawal by ICD-10 and confirmed by senior consultant psychiatrist.

Exclusion criteria--Adults with History of functional psychiatric disorder, Other substance abuse except nicotine, Chronic debilitating illness, Delirium due to other causes, Head injury in past, Jaundice due to other known causes(viral, obstructive jaundice),Benign or malignant brain tumor, Neurosurgical interventions in the past were excluded from the study

Assessment Tools-1) Clinical Institute Withdrawal Assessment of Alcohol Scale, revised (CIWA-Ar) [10] 2) ICD- 10 was used to diagnose alcohol withdrawal including delirium tremens. [9]

PROCEDURE:

All patients in the age group 18-65 years fulfilling the inclusion criteria were included for the study. For estimation of Serum ion (Na^+, k^+, Mg^{2+}, Cl)and hepatic enzymes (ALT, AST , GGT) 5 ml blood was collected from intravenous route in drug naive status on the first day of admission and estimation was done at advanced clinical biochemistry laboratory, dept of biochemistry. The alcohol withdrawal patients developing Delirium tremens (F10.4) formed one study group (Group B). Another (Group A) was selected with age and sex matched Alcohol withdrawal population, which are not with delirium tremens (F10.3).

METHODS FOR BIOCHEMICAL PARAMETERS-

ESTIMATION OF SERUM Na+,K+,Cl----*ion electrode Selective (IES)* [11] technology

ESTIMATION OF SERUM Mg++ [12] **---** *Calamagite method*

Estimation of ALT, AST and GGTP---*In vitro diagnostic test for quantitative determination* [13]

Comparison and analysis of the observed was done between group A (F10.3) and group B (F10.4) by using Statistical Package for the Social Sciences (SPSS-20).

RESULTS

SUBJECT CHARACTERISTICS: At the end of one year data was studied from a group of 50 subjects with a diagnosis of alcohol withdrawal delirium tremens (F10.4) and another group of 50 subjects who were alcohol withdrawal not in delirium tremens (F10.3). It is evident from the age distribution data, that both the delirium and non delirium alcohol withdrawal groups is mostly middle aged person. The DT group has a mean age of 42.36 years with a standard deviation of 8.55 years and the non DT group also has mean age of 41.72 years with a standard deviation of 7.71 years. Males comprised mostly in of both the groups than females.

Comparison of Serum electrolytes level in both delirium (groupF10.4) and non delirium group (group F10.3)

Serum Na^+, k^+, Mg^{2+}, and Cl^- were estimated on the first day of admission in drug naive state. In the delirium tremens blood samples, the mean values of different parameters are observed as; serum sodium (136.08 ± 5.669), serum potassium (3.17±0.611), serum magnesium (2.239 ± 0.314) and serum anion chloride (99.582 ±7.75). Although Hypokalemia and derangement of serum ions noted to lower margin of their normal range, the analysis of variance is applied among various age group, but no significance difference for serum ions is found among various age clusters in delirium tremens group (tab-1).

TABLE 1: AMONG VARIOUS AGE GROUPS, LEVEL OF SERUM Na+ ,K+, Mg++ and Cl- IN ALCOHOL WITHDRAWAL WITH DT CASE(F10.4).

AGE GROUP (years) (cases)	Serum Na+ (meq/dl)		Serum K+ (meq/dl)		Serum Mg+ (meq/dl)		Serum Cl- (meq/dl)	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
18-29 (n =2)	140.9	1.27	2.61	.68	2	.14	96	7.07
30-41 (n=21)	137.02	3.39	3.37	.58	2.27	.29	100.4	5.73
42-53 (n=23)	137.11	5.34	3.04	.57	2.19	.25	99.83	7.7
54-65 (n=4)	130.3	13.02	3.16	.78	2.4	.65	95.27	16.47
ANOVA p value	0.09		0.18		0.39		0.601	

* *p* value significant at <0.05

In the non delirium alcohol withdrawal group, the mean value of serum sodium is 138.42 ± 3.5, significance difference of serum Na+ is noted among different age group (Tab-2).The mean value of serum potassium is 3.41± 0.52. Hypokalemia is noted in the 54-65 age group. The mean serum magnesium in the

non delirium group is 2.43± 0.45. However, the values of magnesium noted in normal range among the various age groups. For serum anion chloride, the observed mean value is 101.55 ±4.87. The hypocholoridemia is noted 95.5+/-6.8 in younger age group and a significant difference is found between various age group with p value 0.025(p<0.05).

TABLE–2: AMONG VARIOUS AGE GROUPS,LEVEL OF SERUM Na^+,K^+,Mg^{2+} and Cl- in non DT CASES(F10.3)

AGE GROUP(years) (cases)	Serum Na+ (meq/dl)		Serum K+ (meq/dl)		Serum Mg++ (meq/dl)		SERUM Cl- (meq/DL)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
18-29 (n=3)	134.16	4.45	3.51	.02	2.03	.05	95.5	6.8
30-41 (n=18)	140.24	2.54	3.38	.44	2.5	.31	103.7	3.9
42-53 (n=25)	137.8	3.65	3.49	.58	2.37	.44	100.9	4.74
54-65 (n=4)	136.9	2.5	2.9	.457	2.8	.914	100.3	4
ANOVA P VALUE	0.01*		0.24		0.113		0.025*	

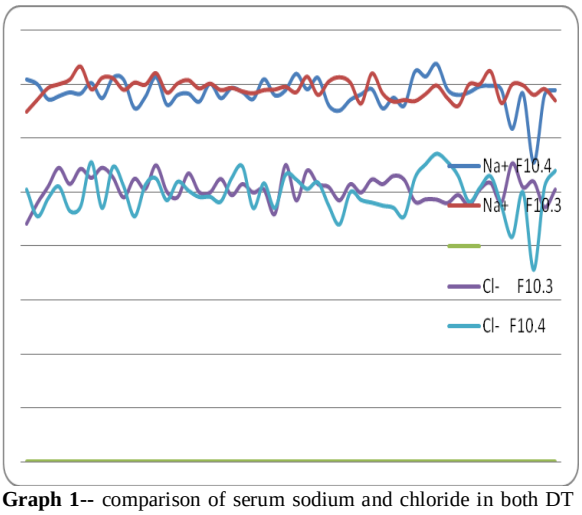
* *p* value significant at <0.05

The unpaired t test and ANOVA is applied for the calculation of statistical significance between the two groups. The two-tailed P value for serum sodium equals 0.0691 and by conventional criteria, this difference is not quite statistically significant. In both groups hypokalemia is noted and the two-tailed P value for serum potassium between the two groups 0.037 (p<0.05). By conventional criteria, this difference is considered to be statistically significant. Same way unpaired t test applied for serum magnesium between the two study and control group is also found statistically significant, p value .017(p<0.05).The serum chloride value between the two groups is found 0.137.it is not statistically significant between F10.3 and F10.4

TABLE–3- AS A WHOLE ,COMPARISON OF SERUM Na+, K+, Mg++, cl- IN CASES OF GROUP A (10.3) and GROUP B(10.4)

	Serum Na+		Serum K+		Serum Mg++		Serum CL-	
	Mean	SD	Mean	SD	Mean	SD	MEAN	SD
Group A 10.3	138.42	3.559	3.41	.5206	2.43	.4572	101.55	4.87
Group B 10.4	136.08	5.669	3.17	.611	2.239	.314	99.582	7.75
Significance p value	.069		.037*		.017*		.137	

* *p* value significant at <0.05

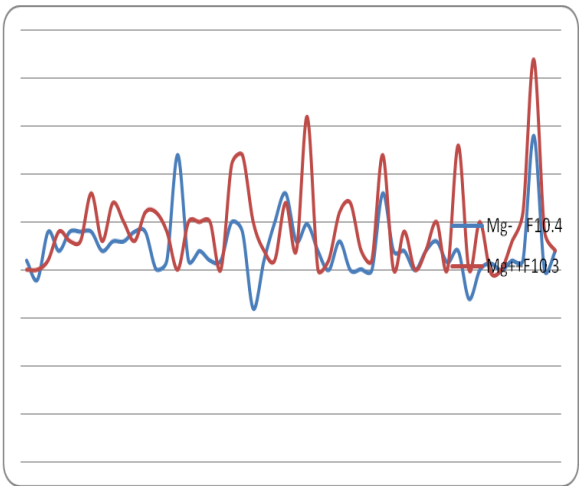


Graph 1-- comparison of serum sodium and chloride in both DT GROUP [F10.4] and non DT Group[F10.3]. *X AXIS-NO OF CASES with ascending ages ,Y AXIS-SERUM LEVEL* . [normal serum Na^+= 135-155 meq/l, serum Cl^- = 98-106 meq/l]

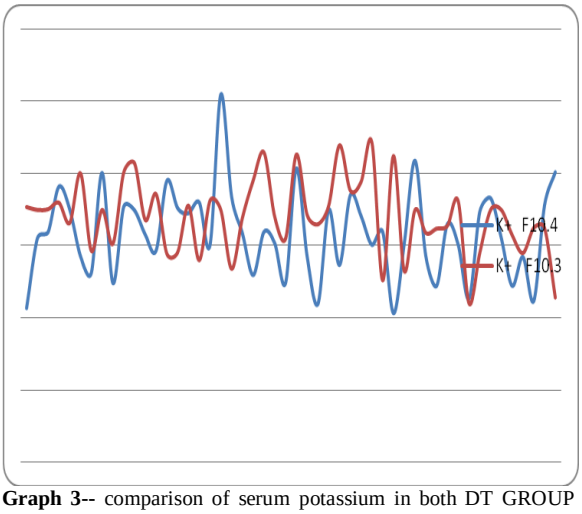
Comparison of sodium and chloride between the two groups as a whole shows no significance, however in the 30-41 age group both sodium and chloride level varies significantly with p value 0.025 and 0.04 respectively. In other age groups no significant difference noticed for sodium and chloride between the two delirium and non delirium groups.

Serum magnesium and potassium level vary significantly between the both groups. In this study, it is seen that potassium level varies significantly in 42-53 age group with p value .0095. Same way magnesium level vary significantly with p value0.02 in 30-41 age cluster between both

delirium and non delirium group. In other age group the difference of these two serum ion is not significant.



GRAPH 2-serum magnesium level in both delirium and non delirium group. *X AXIS-NO OF CASES with ascending age ,Y AXIS-SERUM LEVEL*[Normal reference value Serum Mg^{2+} =1.3-3.5 meq/l]



Graph 3-- comparison of serum potassium in both DT GROUP and non DT Group. *X AXIS-NO OF CASES with ascending age, Y AXIS-SERUM LEVEL .[Normal* serum K^+ = 3.5-5.5 meq/l]

Comparison of Hepatic enzymes level in both delirium (group F1O.4) and non delirium group (group F10.3)-

Serum level of hepatic enzymes ALT, AST and GGT was estimated on the first day of admission from diagnosed alcohol withdrawal patients with DT at advanced clinical biochemistry laboratory, dept of biochemistry. Hepatic enzymes level observed deranged upto upper side in delirium group. The mean values of hepatic enzymes gama glutamyl transpeptidase (GGTP), alanine transaminase (ALT), aspartate transaminase (AST) were observed 847.71±718.75, 88.28±65.69, 198.74± 159.75 respectively.

TABLE 4: AGE WISE LEVEL OF SERUM ALT, AST, GGTP IN ALCOHOL WITHDRAWAL WITH DT CASES(GROUP B) F10.4

AGE GROUP (years) (no of cases)	ALT (IU/dl)		AST (IU/dl)		GGT (IU/dl)	
	Mean	Sd	Mean	Sd	Mean	Sd
18-29 (n=2)	96.5	23.33	157	65.05	736	800.4
30-41 (n=21)	101.5	57.43	225.1	195.1	1052.2	956.9
42-53 (n=23)	80.96	39.23	192.3	131.46	749.68	418.14
54-65 (n=4)	56.5	35.76	117.75	140.5	393.5	432.13
ANOVA p value	0.27		0.63		0.29	

* *p* value significant at <0.05

The derangement of hepatic enzymes is also noted in the non delirium (F10.3) group. Mean values of GGTP, ALT, AST are observed as 501.2± 323.82, 103.54± 61.52, 142.44± 76.84 respectively. The maximum variation of GGTP is noted in54-65 age group, however values of AST,ALT is observed maximally in 54-65 and 30-41age group respectively. However, on analysis it was found that parameters are non significant among various age groups.

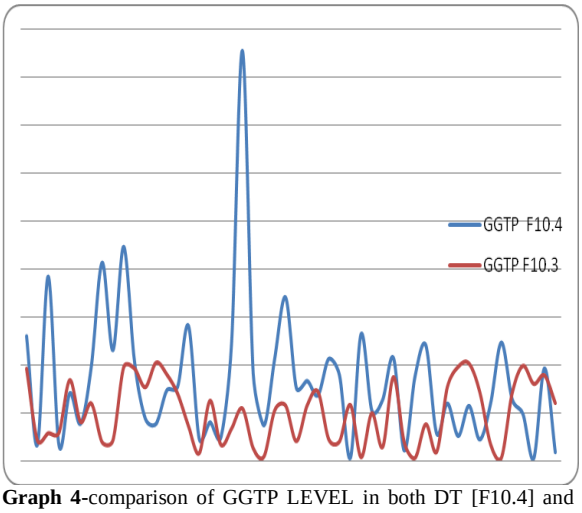
TABLE–5: AGE WISE LEVEL OF SERUM ALT,AST,GGTP IN non DT CASES(GROUP A)F10.3

AGE GROUP (years) (no of cases)	ALT (IU/dl)		AST (IU/dl)		GGTP (IU/dl)	
	Mean	SD	Mean	SD	Mean	SD
18-29 (n=3)	81.66	7.57	127.66	27.59	484.6	411.6
30-41 (n=18)	118.9	71.8	153.33	71.7	552.8	309.8
42-53 (n=25)	93.6	59.8	129.4	75.79	415.2	319.4
54-65 (n=4)	112.4	33.07	185.77	126.52	818.7	165
ANOVA P VALUE	0.537		0.494		0.104	

* *p* value significant at <0.05

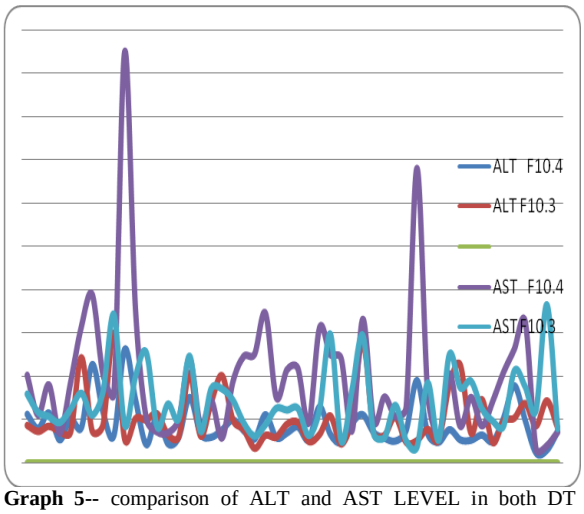
The unpaired t test and ANOVA is applied for the calculation of statistical significance between the two groups as a whole. The hepatic enzymes mean GGTP value between the two group is found to be highly statistically significant [the p value0.002 ($p<0.05$)]. It is seen that significant variation noted for GGT value in 30-41 age group and 42-53 age group with p

value 0.04 and 0.003 respectively between delirium and nondelirium group.



Graph 4-comparison of GGTP LEVEL in both DT [F10.4] and non DT Group[F10.3] *.X axis-no of cases with ascending age ,Y axis-serum level of GGTP*

The mean AST value is also found statistically significant [p value .027(p<.05)] as a whole between the delirium and non delirium group. Variation of AST value found significant in 42-53 age group with p value0.04. The hepatic enzyme ALT level is deranged in both groups, however it is not significantly changed between the delirium and non delirium group. (tab-6)



Graph 5-- comparison of ALT and AST LEVEL in both DT GROUP [F10.4] and non DT Group[F10.3] *X AXIS-no of cases with ascending age ,Y AXIS-serum level*

TABLE–6 COMPARISON OF SERUM ALT, AST, GGTP IN CASES OF GROUP A (10.3) and GROUP B(10.4) AS A WHOLE

	ALT		AST		GGTP	
	Mean	SD	Mean	SD	Mean	SD
Group A F10.3	103.54	61.52	142.44	76.84	501.2	323.827
Group B F10.4	88.282	48.09	198.74	159.75	847.714	718.75
Significance p value	.170		.027*		.002*	

* *p* value significant at <0.05

In the (18-29) age group, the hepatic enzyme and serum ions level are studied by unpaired t test, however no significant findings are observed between delirium (F10.4) and non delirium alcohol withdrawal (F10.3) group. In 30-41 age group, Significant difference is observed for serum Na+, Mg++, cl- ions and GGTP enzyme level (P<0.05). Though hypokalemia is noted in this very age groups in both groups, no significant changes of serum potassium is noticed between the two groups. There is 25 and 23 study sample between delirium and non delirium group in 42-53 age group and significant difference is noted (p<0.05) for serum potassium and hepatic enzymes AST and GGTP level. In the 54-65 age, where both groups contains 4 participants each, Hypokalemia, hypochloridemia and deranged levels of hepatic enzymes noted in delirium group, However no significance difference (p>0.05) of serum ions and hepatic enzymes are noted between study and control group.

DISCUSSION

The study is a sincere attempt to evaluate the factors and biochemical changes in delirium tremens. At the end of one year, data related to 50 patients with delirium tremens (F10.4) and 50 age and sex matched alcohol withdrawal without delirium tremens (F10.3) were interpreted and evaluated with CIWA scale and ICD 10. The age of participants in both the group

ranged between 18 to 65 years. The control group (F10.3) consisted of 48 males and 2 females. The study group (F10.4) consisted of 49 males and 1 female.

The group comprising of delirium tremens (F10.4) had a significant difference in serum K+ than the non delirium alcohol withdrawal group (mean 3.17±0.611) i.e. they have decreased level of potassium as compared to the control group (F10.3), which is similar to the findings of study done by others. [8,14] Significant difference in serum Mg++is observed in delirium group (mean2.23± 0.31) than the control group i.e. they have hypomagnesemia as compared to control, which is similar to the other studies [15,16,18,21,24] .Serum sodium is not changed significantly in study and the control group (mean136.68 ± 5.6) which is similar to the findings of others. [21] In a study done by Shunk Ling, [25] Blay Sl et al, [8] the author has found significant changes of serum sodium in delirium tremens group where the control group was normal population. Serum chloride value is not significantly changed in the delirium (mean 99.58± 27.75) when compared with the control group. However in previous study done by Kanitz R D et al [20] Wetterling T et al [14] and Michel j et al, [26] the author has found decreased parameters of serum electrolytes, both K+, Cl- in delirium tremens patient. However Blay SL et al [8] in their study found normal level of serum chloride in both alcohol withdrawal and delirium tremens group.

Hepatic enzyme serum GGTP value (mean 847.71±718.75) is changed significantly in the delirium group than the non delirium group i. e. delirium tremens have increased GGTP enzyme level which is similar to research finding of others. [14,19,20,22,26] AST (mean 198.74 ±159.75) level is changed significantly in delirium group than non delirium control group i,e they have increased AST level in delirium tremens which is also similar to other studies. [17,19,22,23] As hepatic enzyme derangement is itself is an indicator of recent and acute damage to the liver. It may also explain the higher occurrence of DT in the group, as hepatic derangement itself can cause delirium. There is no significance difference in the level of serum ALT in delirium (mean 88.28 ± 65.69) and non delirium group in this study. However Kanitz R D et al [20] in his study found that the risk for development of delirium tremens is prior alcohol withdrawal seizures or delirium, decreased serum chloride and potassium concentrations, elevated serum levels of ALT and γ-glutamyl transferase. Wietholtz H et al [22] in his study also noticed that only GGTP value has changed significantly among in delirium tremens, and other parameters are not changed significantly.

CONCLUSION

The present study has shown that delirium tremens patient have a considerable amount of derangement in both hepatic enzymes level and serum ion levels. The incidence of Delirium tremens is more in case of elderly age group and lower socio-economic class.

The serum potassium and magnesium level of delirium tremens patient are low and there is more derangement of hepatic enzymes especially AST and GGTP to upper range as compared to normal alcohol withdrawal.

STRENGTHS OF THE STUDY

- The current study is for evaluation of biological parameters of cases with alcohol dependence syndrome who develop Delirium Tremens and parameters are compared with age and sex matched alcohol withdrawal non delirium group.
- Detailed clinical assessment was conducted and all the indicated laboratory investigations; i.e. for hepatic enzymes and serum ions were performed in advanced biochemical laboratory, Assam medical college.

LIMITATIONS:

1. The study involved one-time assessment and lacked follow up. The reason for this was time constraint.

2. The sample size of the study was small.
3. Cases included were those which were in drug de-addiction center, psychiatry department which may have with less medical co morbidity. However, As alcohol is known to be associated with various medical conditions and higher morbidity and mortality, the case selection may have had an influence on the current findings.
4. Cases included were those with habit of different types of alcohol; homemade, country made, Indian made foreign liquor etc where percentage of alcohol are variable and duration of alcohol taking habit were also variable.

FUTURE IMPLICATIONS

This study emphasizes on the holistic approach of alcoholism and alcohol withdrawal care. Apart from the physical sign symptoms of a alcohol withdrawal patient the derangement in serum level should also be taken into consideration. Targeting and correcting the derangement in serum level such as both serum anions and cations can prove to be a key factor in the treatment and survival of the patients and impart them a healthy quality of life.

Future prospective studies are needed to address the issue of derangement of serum ions and hepatic enzymes level as a predictor in patients with delirium tremens, as well as the correlation of hepatic enzymes with serum ions in alcohol withdrawal patient. In the management of DT by correcting the serum ions which correlated with deranged hepatic enzymes, to cut short delirium duration as delirium tremens is itself a dreaded complication in alcohol withdrawal patients, especially in the Indian context where very few studies have dealt in this area.

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Declaration of interest: None

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