Research Paper

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Level of Serum Electrolyte in Depression Patients.

Medical Science

KEYWORDS : - S. electrolyte, depression mild, moderate, severe depression

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ABSTRACT

The present study was planned to assess the levels of serum electrolytes (Na, K and Ca) in patients of major depression in Indian population. A total of 64 patients of 20-60 years of age(42 females & 22 males) of depression were compared with the age matched healthy volunteers. The severity of depression was assessed by DSMV- IV criteria and graded as mild, moderate and severe depression. The mean age of all the patients was 32.75±8.52 years. The mean age of the control subjects were 34.56±7.80 years. The blood sample was assessed for serum electrolytes (Na, K and Ca) by using a Kit in Physiology department and the results were compared with the control group. Results- With the severity of depression S. Na levels significantly increases which gave an evidence that the grades of depression is associated with increase disturbance in the S. Na levels in depression. The serum calcium levels were found significantly higher in depression patients as compared with the age matched control group. Conclusion- Our study shows that these ions have role in the pathophysiology of the major depression disorder as there is disturbance in the levels of serum sodium and calcium concentration in depression.

INTRODUCTION:

Depression is one of the most common and recurrent disorders that affects people today. An average onset age is in the mid-20. It can affect people of all ages, both men and women. World Health Report (WHR 2001) estimated that there are about 121 million people worldwide suffering from depression. Depression is a type of mood disorder in which there is one or more episodes of depressed mood or loss of interest for at two weeks duration accompanied by at least four additional symptoms of depression i.e change in appetite, weight, sleep and psychomotor energy, feeling of worthlessness, difficult in thinking and making decisions etc.(1). Depression is thought of a disease which is biochemical -based or emotionally- rooted. Nutrition play a key role in the onset as well as severity and duration of depression(2,3). Depression can be graded as mild ,moderate and severe as per WHO classification depending upon the presence of symptoms. Various past studies showed the role of serum electrolytes (Na, K, Ca, Mg) imbalance in etiopathogenesis of depression(4,5). The major serum electrolytes Na, K, Ca and Mg are involved in transmission of impulses in CNS. As the ion exchange mechanism plays the critical role in generation of action potential in neurons including the metabolism and the release of monoamines implicated in the pathogenesis of Affective disorders.

As there were conflicting reports of serum electrolytes in depression patients and so this study was done in an attempt to measure the serum electrolytes (Na, K, and Ca) in patients of depression in Indian population and to know the serum electrolyte status in depressed patients.

MATERIAL & METHODS:

This study was conducted in the psychiatry outpatient department of Motilal Nehru Medical College and Swarooprani Hospital,Allahabad. The present study included 64 patients of 20-60 yrs of age(42 female & 22 male patients) of major depression of unipolar type according to DSMV-IV (6) criteria and compared with the 30 age matched healthy control subjects (18 female & 12 male subjects) mainly from the staff of the MLN & Swarooprani Hospital . Only newly and freshly diagnosed cases were included. The severity of the disease was assessed by DSMV-IV criteria and ICD-10 and graded as mild, moderate and severe depression.(7) There were 12 mild, 17 moderate and 35 severe grade depression patients. There were 42 female depression patients who included 7 mild, 10 moderate and 25 severe grades of depression patients. Whereas 22 male patients of depression which were included 5 mild, 7 moderate and 10 severe grades of depression patients.

The patients included were in the age group of 20-60 years. A complete and detailed history and examination of each patient was taken and then classified as mild, moderate and severe cases according to the criteria given by WHO in ICD -10(International Classification of Disease) and by using Hamilton rating scale(7,8). A format was prepared and each patient's history was assessed according to that with particular emphasis on the following point's eg.name, age, sex, religion, marital status, socioeconomic status, educational qualification, duration of illness etc.

Depending upon the answers given by the subject's results was analysed. The various past studies concluded that the antidepressant drug treatment can alter the serum electrolyte levels **(Widmer J et al, 1993)(**9**).** So only those subjects who had not taken any prior antidepressant treatment were included in the study.

Inclusion Criteria:

1. Newly and freshly diagnosed cases only
2. Depression cases diagnosed on the basis of DSMV-IV and ICD-10 criteria was included in the study by using Hamilton rating scale.

Exclusion Criteria:

1. Co-morbid conditions like hypertension, diabetes mellitus, and tuberculosis.
2. The patients having history of any heart disease, liver disease, any endocrinal and renal diseases.
3. The patient having history of any narcotic drug abuse and receiving any mineral supplementation (calcium)

The blood sample was withdrawn by venipuncture into a disposable syringe and analysed for serum electrolytes (Na, K and Ca) by Kit in the department of Physiology and the results were compared with the control group. For quantitative estimation of serum Na and K SP Twin Electrolyte Kit was used and Colorimetric method was applied. For quantitative estimation of serum Ca Calcium Arsenazo-3 Kit was used .

Statistical analysis:

All statistical analysis done by using SPSS 20.0. All values were expressed as Mean±SD. Differences between the study group and

controls were examined using the independent t-test and one way ANOVA(10) because it followed normality. A two tailed test (P<0.05) was considered statistically significant.

RESULTS:

The mean age of all the patients was 32.75±8.52 years and that of control subjects was 34.56±7.80 years . In the present study, we found that Na+ and K+ levels were not changed when compared with the age matched control group . Depression patients had higher levels of Ca++ in comparison to the controls (Table-1). The value of serum Ca++ is statistically significant **i.e. p= 0.044 (p<0.05).**

In our study on comparison between the mild, moderate group and severe group of patients we found that high normal values of serum sodium levels which is within the normal range(Table -2)

Table-3 shows the comparison between the control and cases group of male patients we found that Na+ is not significant but we found high normal values of serum sodium levels which is within the normal range and serum Calcium levels is significant p=0.0401 (p<0.05).

Depression in female patients shows that on comparison between the control and cases group of female patients, it is seen that serum Calcium levels is statistically significant p=0.031 (p<0.05)(Table-4).

Table- 5 shows that on comparison between the control and moderate cases group of patients, it is seen that serum Calcium levels is statistically significant p=0.044 (p<0.05).

Table -6 shows that on comparison between the control and severe cases group of patients we found that Na+ is not significant but we found high normal values of serum sodium levels which is within the normal range and serum Calcium levels is significant p=0.034(p<0.05).

TABLES-1

COMPARISON OF TOTAL CONTROLS VS TOTAL CASES

Groups	Age	Na+ (meq/l)	K+ (meq/l)	Ca++ * (meq/l)
Total Controls(μ) (n=30)(σ)	34.56±7.80**	141.86±1.94	4.30±0.57	1.16±0.21
Total Cases(μ) (n=64))(σ)	32.75±8.52	142.45±1.67	4.17±0.35	1.34±0.38
P Value#	0.171	0.221	0.121	0.044

** Mean±SD

Independent t-test using SPSS 20.0

*Serum Calcium level (Ca++) is significant between total cases and total control i.e. p=0.044(p<0.05).

TABLE-2

LEVELS OF SERUM ELECTROLYTES IN DEPRESSION PATIENTS ACCORDING TO SEVERITY OF DEPRESSION

Groups	Age	Na+ (meq/l)	K+ (meq/l)	Ca++ (meq/l)
Mild(μ) (n=12)(σ)	36.5±7.56**	141.08±1.75	4.15±0.35	1.34±0.36
Moderate(μ) (n=17)(σ)	31.52±3.64	142.77±1.71	4.25±036	1.33±0.24
Severe(μ) (n=35)(σ)	31.88±8.50	144.0±1.66	4.35±0.38	1.34±0.20
P Value#	0.181	0.058	0.345	0.245

****Mean± SD,# One Way ANOVA**

This table shows the output of the ANOVA analysis and statistically significant difference between group means. As comparison between the mild and moderate group and severe group of patients we found that high normal values of serum sodium levels which is within the normal range.

TABLE-3

COMPARISON OF TOTAL MALE CONTROLS V/S TOTAL MALE CASES

Groups	Age	Na+ (meq/l)	K+ (meq/l)	Ca++ * (meq/l)
Male Controls(μ) (n=12)(σ)	34.20±7.34**	141.06±1.90	4.30±0.58	1.15 0.23
Male Cases(μ) (n=22))(σ)	32.04 ±5.4	142.42 ±1.78	4.17 ±0.33	1.33 ±0.32
P Value#	0.321	0.054*	0.211	0.0401*

** Mean±SD

Independent t-test using SPSS 20.0

*As comparison between the control and cases group of male patients we found that Na+ is not significant but we found high normal values of serum sodium levels which is within the normal range and serum Calcium levels is significant (p<0.05).

TABLE-4

COMPARISON OF TOTAL FEMALE CONTROLS V/S TOTAL FEMALE CASES

Groups	Age	Na+ (meq/l)	K+ (meq/l)	Ca++ * (meq/l)
Female Controls(μ) (n=18)(σ)	33.56±7.45**	142.05±1.80	4.26±0.56	1.16±0.17
Female Cases(μ) (n=42))(σ)	33.11±9.8	142.84±1.76	4.13±0.36	1.34±0.40
P Value#	0.323	0.213	0.235	0.031*

** Mean ±SD

Independent t-test using SPSS 20.0

*As comparison between the control and cases group of female patients, it is seen that serum Calcium levels is significant (p<0.05).

TABLE-5

COMPARISON OF ALL CONTROLS V/S MODERATE CASES

Groups	Age	Na+ (meq/l)	K+ (meq/l)	Ca++ * (meq/l)
Controls(μ) (n=30)(σ)	34.20±7.34**	141.86±1.94	4.30±0.57	1.16±0.21
Moderate Cases(μ) (n=17))(σ)	31.52±3.64	142.77±1.71	4.25±0.36	1.33±0.24
P Value#	0.123	0.231	0.087	0.044

**Mean ±SD

Independent t-test using SPSS 20.0

*As comparison between the control and moderate cases group of patients, it is seen that serum Calcium levels is significant (p<0.05)

TABLE -6

COMPARISON OF ALL CONTROLS V/S SEVERE CASES.

Groups	Age	Na+ (meq/l)	K+ (meq/l)	Ca++* (meq/l)
Controls(μ) (n=30) (σ)	34.20± 7.34**	141.86±1.94	4.30±0.57	1.16±0.21
Severe(μ) Cases (n=35) (σ)	31.88±8.50	144.0±1.66	4.35±0.29	1.34±0.20
P Value#	0.087	0.059*	0.122	0.034*

**Mean ±SD
Independent t-test using SPSS 20.0
*As comparison between the control and severe cases group of patients we found that Na+ is not significant but we found high normal values of serum sodium levels which is within the normal range and serum Calcium levels is significant ($p<0.05$).

DISCUSSION

In the present study, we have found that Na+ and K+ levels were not changed when compared with the age matched control group and this is comparable with reports from other investigators **(Widmer J et al 1997)** (11). Some of the previous studies have obtained concerning to the plasma concentration of either K or Na in the depressed patients. **Frazer et al and widmer J et** al reported a small increase in Na levels in patients of major depression(12) and similarly in our study we have also found Na levels higher than the control group but within the normal limits (13).This finding of our study can be supported by **Bruinvels et al (1975**) who directly supported the involvement of divalent ions Ca and Mg in increased uptake of catecholamine precursors i.e L-tryptophan in normal levels of Na and thus so catecholamines can be an etiological factor in depression(14). In **1965**, **Schildraut J, et al (15)** gave the catecholamine hypothesis of affective disease and he suggested the role of catecholamines in the causation of depression. Later, this hypothesis was rejected. An increase in erythrocyte K+ levels in 34 depressed patients had been reported **(Esche et al 1988)(16).**

We also found a significant higher serum Na+ levels in moderate and severe grade depression subjects as compared with controls although they were within normal range only is comparable with the **Ramsey et al 1979 and Singh A.K et al 2011(17,18).** We did not found any significant change in serum K+ levels in any subgroups of depression patients as compared with the age matched control groups. We have found significantly high levels of serum Ca++ in cases as compared with the control group's levels which are in accordance with the reports given by **Linder J 1989, , Dubovsky Steven L et al 1989**(19,20).

So, the changes which we have found in the present study could be due to dependence of distribution changes of these ions in different phases of depression and also due to the weakness of ATPase channels which transport these ions across the cell membrane(21).

The disbalance in the levels of Ca in the present study prove importance in the etiopathology of the major depression(22).

CONCLUSION:

In this study we saw an increase prevalence of depression in females because the number of female depression patients (42) outnumbered the male patients (22) attending the psychiatric O.P.D. We can conclude that these ions have role in the pathophysiology of the depression as there is disturbance in the levels of sodium and calcium concentration in depression. Thus, we conclude that the changes found in the serum Na+, K+ and Ca++ levels could be due to difference of distribution of these ions during the different grades of depression and also may be due to depressed activity of sodium-potassium ATPase which transports these ions through the cell membrane.

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