ABSTRACT

Introduction: Depression, a mood disorder is a common mental health problem in all sections of people of the society, and it causes physical, psychological and social symptoms. So, keeping this in mind, the study is carried out to estimate serum zinc in cases of depression and compare the levels with that of age and sex matched healthy controls. Aim: To measure the serum zinc in clinically diagnosed patients with depression and study their levels in different age groups and gender.

Methods: serum zinc estimation is done by colorimetric method. Serum albumin estimation is done by Bromocresol Green(BCG) method. Results: Serum zinc was significantly (p<0.01) lower in the cases (58.55±8.70 µg/dl) than in the controls (64.78±9.86 µg/dl). Conclusion: It is suggestive that Serum zinc levels being lower in cases of depression; may have a role on the causation or be a result of depression. So, longer duration of study and with a larger sample size may reveal significant insights on the role of this micronutrient in depression.

Keywords: Psychiatry, Assam, micronutrient

INTRODUCTION
Depression, the common psychological disorder, affects about 121 million people worldwide. World Health Organization (WHO) states that depression is the leading cause of disability as measured by Years Lived with Disability (YLDs) and the fourth leading contributor to the global burden of disease. By the year 2020, depression is projected to reach second place in the ranking of Disability Adjusted Life Years (DALY) calculated for all ages. Today, depression already is the second cause of DALY’s in the age category 15-44 years.1

It is estimated that depression is the cause of 50-70% suicides.2 There are some evidences that depression is accompanied by activation of the Inflammatory Response System (IRS). Increased numbers of leucocytes, monocytes, neutrophils, activated T-lymphocytes and secretion of neopterin and prostaglandins.3 An Acute Phase (AP) response is indicated by changes in serum acute phase proteins4 and increased secretion of proinflammatory cytokines, such as interleukin-1b(IL-1b), IL-6 and interferon-g (IFN-g). Since these proinflammatory cytokines induce IRS activation, the above changes in depression may be caused by increased production of IL-1b, IL-6, and IFN-g. IRS activation is associated with decreasing in serum zinc. There is now evidence that depression is accompanied by lower serum zinc.4 IRS activation results in decreased serum albumin concentration and availability of less zinc(Zn) binding protein.5 However, it is not known whether the decrease in serum zinc in depression is attributable to lower serum albumin.

Zinc is an antagonist of the glutamate/N-methyl-D-aspartate (NMDA) receptor and exhibits antidepressant like activity in rodent tests/models of depression. This preliminary clinical study demonstrated the benefits of zinc supplementation in antidepressant therapy.6 All the above data indicate the important role of zinc homeostasis in the psychopathology and therapy of depression and potential clinical antidepressant activity of this ion.

The present study aims to measure the serum Zinc in clinically diagnosed patients with depression and study their levels in different age groups and gender.

METHODS

The present study comprised of 50 cases of depression and 50 age and sex matched healthy controls visiting the Department of Psychiatry, Assam Medical College, Dibrugarh, Assam. Inclusion Criteria: Patients of age group 16 to 50 years, newly diagnosed...
cases of depression as diagnosed by DSM IV and previously diagnosed cases of depression in which patient is drug free for atleast one month. Exclusion Criteria: Patients with other associated psychiatric disorders and dementia, Substance abuse, systemic illness like diabetes, hypertension, hypothyroidism, renal disease, liver disease, obesity and cancer, pregnant ladies and lactating mothers, patients on multivitamins and oral contraceptive pills (OCP) and patients with mental retardation and hearing impairment. The Grading of the cases included in the present study into mild/moderate/severe was done using the 17 item Hamilton Depression Rating Scale.

METHODS

ESTIMATION OF SERUM ZINC (colorimetric method)\textsuperscript{7,8}

Zinc in an alkaline medium reacts with Nitro-PAPS to form a purple coloured complex. Intensity of the complex formed is directly proportional to the amount of zinc present in the sample.

Alkaline medium

\[
\text{Zinc} + \text{Nitro-PAPS} \rightarrow \text{Purple coloured complex.}
\]

ESTIMATION OF SERUM ALBUMIN (BROMOCRESOL GREEN [BCG] METHOD)\textsuperscript{9}

Principle: Albumin binds with the dye Bromocresol Green in a buffered medium to form a green coloured complex. The intensity of the colour formed is directly proportional to the amount of albumin present in the sample.

\[
\text{Albumin} + \text{Bromocresol Green} \rightarrow \text{Green Albumin BCG Complex}
\]

Apart from unpaired student’s test, ANOVA, Regression Analysis was the statistical tools applied.

Serum Zinc in cases (58.5 \pm 8.70 \text{ig/dl}) was significantly lower (p<0.01) than in the controls (64.78 \pm 9.86 \text{ig/dl}). Serum albumin was also lower in the cases (3.70\pm 0.41\text{g/dl}) than in the controls (3.85\pm 0.46 \text{g/dl}) but not statistically significant.

Table 1 Comparison in cases and controls

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Cases</th>
<th>SD</th>
<th>Controls</th>
<th>Mean</th>
<th>SD</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum Zinc(\text{ug/dl})</td>
<td>58.55</td>
<td>8.70</td>
<td>64.78</td>
<td>9.86</td>
<td>&lt;0.01*</td>
<td></td>
</tr>
<tr>
<td>Serum Albumin(\text{g/dl})</td>
<td>3.70</td>
<td>0.41</td>
<td>3.85</td>
<td>0.46</td>
<td>&gt;0.05</td>
<td></td>
</tr>
</tbody>
</table>

*Statistically significant

Highest number of depression cases included in the study were in the 26-30 years age group (26%), followed by 21-25 years age group (24%),16-20 years age group with only 3 cases showed the lowest number of cases i.e., 6%.

Figure 1 Age distribution of cases

Figure 2 Gender distributions of cases

The diagram shows that majority of the cases in the present study were females. 40% of cases were males and 60% of the cases were females with a male female ratio of 0.67:1.

Figure 3 Different grades of depression

In the diagram, it is seen that mild depression constitutes the majority of the cases under study. 25 cases (50%) of total cases were mild depression, 17 cases (34%) were moderate depression and 8 cases (16%) were severe depression.
Serum Zinc in cases (58.5 ± 8.70 ìg/dl) was significantly lower (p<0.01) than in the controls (64.78± 9.86 ìg/dl). Serum albumin was also lower in the cases (3.70±0.41g/dl) than in the controls (3.85±0.46 g/dl) but not statistically significant.

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>Cases</th>
<th>Controls</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERUM</td>
<td>MALE</td>
<td>FEMALE</td>
<td></td>
</tr>
<tr>
<td>ZINC(µg/dl)</td>
<td>56.0 ± 6.99</td>
<td>60.25 ± 9.40</td>
<td>&lt;0.01*</td>
</tr>
</tbody>
</table>

* = Statistically significant; NS = Not Significant (p>0.05)

From the above table, it is observed that serum zinc in male and female cases were respectively lower than in the male and female controls. However, serum zinc (56.0±6.99 ìg/dl vs. 66.65±9.05 ìg/dl) in the males was statistically significant (p<0.01).

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>r-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum zinc</td>
<td>0.097</td>
<td>NS</td>
</tr>
<tr>
<td>Serum Albumin</td>
<td>0.154</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS –not significant

In the above table, it is observed that serum zinc is lower in cases compared to the controls in all categories of depression cases and it is significantly lower in the moderate depression cases.

In 46 depressed patients, found the serum concentration of zinc was about half of normal value and the difference was statistically significant (p=0.02) between depressed patients and controls. Amani R et al found a linear significant correlation between dietary zinc intakes and its serum levels in samples (r = 0.62; p < 0.001) and Major depressive disorder (MDD) students (r = 0.55; p<0.001). Maes et al found that Serum Zinc (Zn) and Albumin were significantly lower in major depressed patients than in normal volunteers. In healthy volunteers and major depressed patients, there were significant and positive correlations between serum Zinc and Albumin.

Roozbeh Jamshid et al, Maes et al, Mc Loughlin et al also found lower values of serum zinc in depression. Thus, the findings of serum zinc in the present study are consistent with the findings of all the above researchers.

DISCUSSION

On gender wise analysis, serum zinc was found to be lower in the depressed study participants than in the healthy controls in both the genders, and it was statistically significant in the males (p<0.001). When compared with healthy controls, serum Zinc was found to be significant (P<0.05) in the moderately depressed cases (58.94±6.78 µg/dl vs. 65.77±10.62 µg/dl), whereas it was not significant (p>0.05) in the mild (57.94±8.95µg/dl vs. 63.05±10µg/dl) and in the severe depression cases (59.61±12.1µg/dl vs.68.12±9.0810µg/dl).

Serum zinc did not show any statistically significant difference (p>0.05) when analysed in the different grades of depression. Zinc showed the lowest values in the mild cases (57.94±8.95 µg/dl), followed by moderate (58.94±6.78 µg/dl) and severe cases (59.61±12.1 µg/dl) respectively.

The lower zinc level observed in depression could be caused by three different reasons. First, by nutritional deficiencies: primary, inducing the development of depressive symptoms or secondary to depression, resulting from the reduced
appetite, the typical picture of the disease. Patients suffering from depression tend to have lower levels of zinc in the blood than healthy subjects. In a study by Grieger et al an association was found between serum zinc and higher degrees of depression and also a poor nutritional status measured with the Mini Nutritional Assessment in geriatric long term care residents.

Second, an explanation for the reduction in the level of zinc in the blood of depressed patients could be hyper stimulation of the hypothalamic-pituitary-adrenal (HPA) axis, and the associated hypercortisolism. A third and more convincing concept is that, a lower zinc level is the result of inflammation and acute phase response and is associated with oxidative stress.

The low serum zinc as found in the present study can be attributed to low levels of the binding protein, albumin. Maes et al. suggested that major depression is accompanied by activation of the inflammatory response system (IRS). Other signs of IRS activation, which have been reported in major depression, are lowered serum zinc and serum albumin concentrations. In serum, zinc is closely bound to albumin. The results of that study suggest that lower serum zinc in depression is in part explained by lowered serum albumin and by another depression-related mechanism. It is suggested that lower serum zinc in depression may be secondary to sequestration of metallothionein in the liver, which may be related to increased production of interleukin-6. Decreased food intake may also be a contributing fact to low albumin and zinc in depression.

CONCLUSION

From the present study, it was observed that serum zinc was significantly lower in patients with depression as compared to age and sex matched healthy controls. The decrease in serum zinc showed no significant correlation with the severity of depression. In the study, serum zinc was found to have a positive correlation with serum albumin. Zinc appears to have a significant role in depression. If zinc supplementation could lower the effective doses of antidepressants, then some unwanted side effects of such drugs could be decreased. However, there is need for more studies on this subject with larger sample sizes, taking care of all variables and in completely newly diagnosed patient group to peer deep into the problem so as to enable to explore unforeseen areas encompassing this disease syndrome.

Conflict of interest: None.

Ethical clearance: Taken

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Contribution of authors: I (We) declare that this work was done by the author(s) named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

REFERENCES