

Correlation of Serum Zinc Levels with Postpartum Depression- A Case-control Study in North Karnataka

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ABSTRACT

Introduction: Pregnancy is an important event in reproductive mother. At the same time it is associated with stress, which exaggerates the depression. Many factors leads to depression, among them nutrient deficiency like zinc, selenium, iron, calcium, folic acid and vitamin B12 plays a major role.

Aim: To estimate and compare serum zinc levels in females with postpartum depression subjects and healthy controls. To find the relationship between serum zinc levels and extent of postpartum depression.

Materials and Methods: The present study was a hospital-based case-control study, conducted over a period of three months. It included 40 postpartum depression cases and 40 healthy controls. All the participants were subjected to serum zinc levels estimation. Edinburgh Postnatal Depression Scale (EPDS) score was applied. The individuals who scored greater

than 10 were taken as cases and those scoring less than 10 were taken as controls. Data was tabulated and results expressed as mean±SD, student's t-test and Pearson correlation test was applied for correlation.

Results: The present study found decreased serum zinc levels in postpartum depression cases compared to controls. It was found serum zinc levels in cases were 21.63±15.73 µg/dL and 54.16±19.72 µg/dL in controls. There was a negative correlation between the severity of postnatal depression and the serum zinc levels. Not only this, but certain risk factors were also identified, such as age of the mother, months of postpartum, mode of delivery, and the education of the mother.

Conclusion: Decreased serum zinc levels do indeed correlate to a change in maternal mental health, and then the knowledge would not only help in diagnosis by tests, but also further patient care.

Keywords: Edinburgh postnatal depression scale, Maternal mental health, Trace element

INTRODUCTION

World Health Organisation (WHO) defines health as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” [1]. Hence, though a person may seem to be physiologically healthy in all aspects, they may be suffering from other forms of disease which are not so easy to detect by mere physical examination. Mental health should be given just as much importance. Postpartum depression is a condition that affects 10-20% of postpartum mothers and can hamper their ability to care for themselves and others [2,3]. Depression, particularly postpartum depression, can lead to morbidity in the mother, the child, and even the entire family.

After childbirth, the levels of hormones oestrogen and progesterone rapidly drop which leads to chemical changes in the brain which can trigger mood swings. In the early days after birth, this change is commonly observed, but the symptoms can worsen when left untreated or undiagnosed. Another contributing factor of the feelings of depression may be exhaustion and lack of adequate sleep [3,4]. Postnatal depression affects not only the mother but also negatively impacts the cognitive functions of the child as well. Thus, it is an illness which causes noted unhealthy changes in both the mother and the child [5].

In the first 4-5 days after delivery, 50% of women suffer from what is categorised as the “puerperal blues”. This only lasts for a few days. It is characterised by depression, anxiety, tearfulness, insomnia, helplessness, and negative feelings towards the infant. “Postpartum depression” is more gradual and is seen in the first 4-6 months after delivery. The symptoms of postpartum depression in particular are loss of energy and appetite, insomnia, social withdrawal, irritability, and even suicidal attitude [3].

Zinc is a trace element which has many functions in immunology as well as in the central nervous system [6]. It has the second highest concentration in the brain when compared to all the transition metals [7]. Zinc is a component of many proteins as well as over 300 co-factors which are involved in signaling pathways between cells. Zinc modulates the excitability of neurons, and does so by affecting glutamate and Gamma Aminobutyric Acid (GABA) receptors [6]. Zinc has been shown to have antidepressant activity in preclinical and animal trials. In forced rodent swim tests, the combination of low ineffective doses of zinc given along with low ineffective doses of antidepressants, namely citalopram and imipramine, showed antidepressant activity i.e., longer swim time [8]. The study has also shown that treatment of humans with zinc as an antidepressant also relieved the symptoms of depression [9]. Moreover, when treated with antidepressants such as imipramine or citalopram, a 20% increase in ratio of zinc concentration in hippocampus to other areas of the brain is observed. Even on treatment with Electroconvulsive Shock Therapy (EST), there was a relative increase in the zinc concentrations in the hippocampus [10]. Hence, it can be reasoned that serum zinc levels not only can be an effective marker of depression and even postpartum depression, but also, that the supplementation of zinc in new mothers can decrease their risk for postpartum depression. There were sparse and controversial reports on zinc levels in postpartum depression patients [11,12]. Hence the present study was undertaken to estimate and compare serum zinc levels in females with postpartum depression subjects and healthy controls. Also, to find the relationship between serum zinc levels and extent of postpartum depression.

MATERIALS AND METHODS

This was a hospital-based case-control study conducted in S Nijalingappa Medical College and Hanagal SriKumareshwara Hospital

and Research centre, a tertiary care teaching institute in Karnataka, India Institutional Ethics Committee (IEC) approval was taken prior to the study (Reference number-SNMC/IECHSR/2017-18/A57/1.1). Informed written consent was taken from all the participants who are involved in the study at the beginning. The study was conducted over a period of three months from June-August 2018.

Sample size calculation: It was done using Medcell software at 95% confidence level and 80% power of the study. The sample size was calculated using the correlation coefficient of -0.46 as per a study done by Nicols J [9]. Total 80 subjects were included in the study and among them, 40 were cases and 40 were healthy controls. They were categorised as case and controls based on their Edinburgh postnatal depression score.

Inclusion criteria: The subjects were postnatal mothers with depression of age group between 20-30 years, who attended the routine immunisation of their children during 1-6 months after the birth of the baby, and those who attended the psychiatry outpatient department for treatment of depression. Questions were asked according to questionnaire format and classification was done based on EPDS. Those who scored less than 10 were taken as control group, and those who score greater than 10 were considered as cases.

Exclusion criteria: Mothers who were taking multivitamin tablets, mineral supplements, any kind of psychotropic medication, those who were treated for depression and not willing to participate were excluded from the study.

Study Procedure

Under aseptic precaution, 3 mL of venous blood was drawn and allowed to clot. After being centrifuged, the serum was separated. The serum was then used for estimation of zinc by Nitro-PAPS method in semi-auto analyser (Erbachem-5 plus Transasia) by end point method [13,14].

STATISTICAL ANALYSIS

It was done using Statistical Package for the Social Sciences (SPSS) software. All the values were expressed in terms of mean±SD. Student's t-test and Pearson correlation test have been applied. The p-value <0.05 was considered as statistical significance.

RESULTS

The study comprised of 80 participants, out of which 40 were cases and 40 were controls of the age group between 20-30 years. They were classified depending on their Edinburgh score. Women with EPDS more than 10 were considered as cases and EPDS less than 10 were considered as controls.

The demographic characters of cases and controls are depicted in [Table/Fig-1]. The mean age of the women was 24.65±2.4 years in cases and 25.03±3.54 years in controls. Around 28 (70%) of the participants were housewives as shown in the [Table/Fig-1]. Among them 22 (55%) were literates in cases and 27 (67.5%) in controls. Most of the cases had normal vaginal delivery 57.5% and 42.5% had caesarean section, among them 50% were primipara. In controls 70% had normal delivery and 30% had caesarean section, 60% were primipara in them. Postpartum depression was more prevalent in the first three months.

The mean serum zinc levels in cases and in controls is shown in [Table/Fig-2]. There was significant reduction in serum zinc levels as the Edinburgh postpartum depression score increases. There was significant decrease ($p<0.001$) in serum zinc levels in cases compared to controls as shown in [Table/Fig-2].

There was negative correlation between serum zinc levels and Edinburgh postpartum depression score and the difference was statistically significant ($r=-0.24$, $p<0.05$) as represented in [Table/Fig-3]. As the Edinburgh score increases serum zinc levels decreases.

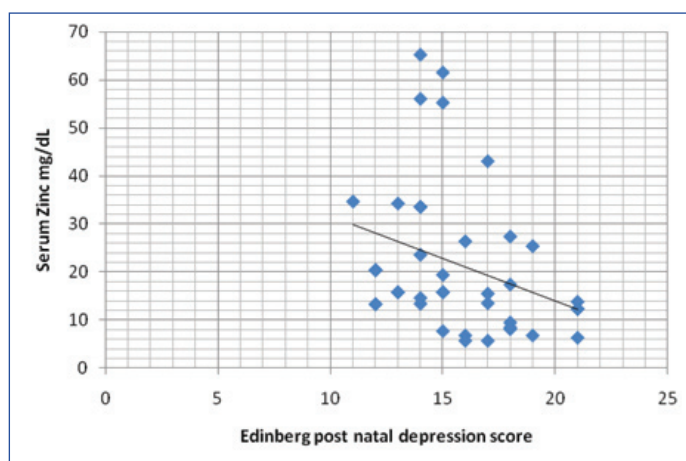
Characteristics	Cases n=40 (%)	Controls n=40 (%)
Age (years)	20-25	22 (55)
	26-30	18 (45)
	Mean±SD	24.65±2.4
Education	Literate	22 (55)
	Illiterate	18 (45)
Occupation	Housewife	28 (70)
	Employed	12 (30)
Delivery	Normal	23 (57.5)
	Caesarean	17 (42.5)
Parity	Primipara	20 (50)
	Multipara	20 (50)
Postpartum duration	1 st month	10 (25)
	2 nd month	11 (27.5)
	3 rd month	10 (25)
	4 th month	6 (15)
	5 th month	1 (2.5)
	6 th month	2 (5)

[Table/Fig-1]: General demographic characteristics in cases and controls.

	Cases n=40	Control n=40	p-value
Serum zinc µg/dL	21.63±15.73	54.16±19.72	0.001**
EPDS	15.36±2.51	3.75±2.3	0.001**

[Table/Fig-2]: Mean values of serum zinc levels and Edinberg Postpartum Depression (EPDS) in cases and controls.

*Highly significant; Student t-test



[Table/Fig-3]: Correlation of serum zinc levels with Edinberg Postpartum depression score in cases.

DISCUSSION

Postpartum depression is a major psychological problem, more common in pregnancy. It affects the health of the pregnant mother, development of newborn baby and inturn the entire family. Literature shows nutrient zinc has anti depressant properties. The present study shows that the serum zinc in cases, i.e., those scoring greater than 10 on the EPDS decreased by 60% as compared to controls. In present sample population, the majority of the cases were in three months postnatal period. A similar study conducted by Wojcik J et al., showed a decrease in early postpartum period which increased a month after delivery [15]. The reason for prolonged deficiency in this study when compared with the above study by Wojcik J et al., was may be due the less sample population taken. It has been shown that the deficiency of zinc is more prevalent in developing countries, especially those with a staple diet of rice [16]. Moreover, in present study, authors have excluded those participants who are taking multivitamins or zinc supplements. It was also observed by Siwek M et al., that serum zinc was lower (by 22%) in depressed patients than in healthy volunteers [17]. In another study, it was observed that women who took a combination of multivitamins along with zinc displayed a substantial decrease in anxiety and depression compared to those women who only took multivitamins

[18]. An animal study by Mlyniec K et al., reported that zinc showed antidepressant effect [19].

In this study, postpartum depression was more in the age group of 22-25 years (55%), than 25-30 years (45%) age group. This concurs with findings by Rubertsson C et al., that young age was a risk factor associated with postnatal depression [20]. Moreover, a study by Sword W et al., also showed that incidence of postpartum depression was more in women below the age of 25 years [21].

It was also seen that when education was taken into consideration in this study, among the depressed population, the individuals were literate (55%) more than illiterate (45%). Literacy was taken as the completion of high school education. However, in the study by Davis L et al., it was found that those with lesser education experienced greater levels of postpartum depression [22]. However, several factors must be taken into consideration in this outcome. Those who are literate and more educated are more likely to be well-informed about mental illness and its consequences, and hence are likely to be more honest when they are struggling.

Present study, observed that those women who had undergone vaginal delivery were more in the depressed population than those who have undergone caesarean section. However, a study by Sword W et al., showed no significant difference in the incidence of postpartum depression when compared to the modes of delivery [21]. Similarly, no such difference was noted in a study by Patel R et al., [23].

In current study, there was negative correlation with Edinburg score, this was consistent with other similar studies conducted on serum trace elements and postpartum depression [15]. In our country, women are given iron and calcium supplementation during antenatal and postnatal period. Since decrease in zinc level correlates to an increase in the postpartum depressive symptoms. Zinc should be supplemented along with iron and calcium to improve quality of life. It is also crucial that counselling should be provided to women during the postpartum period in order to educate them with respect to mental health. In this way, overall well-being and quality of life can be improved, as well as their families too.

Limitation(s)

Sample size was small. Family details like socio-economic status, husband education status, occupation, and support to wife were not taken into consideration.

CONCLUSION(S)

Decreased serum zinc levels were found in postpartum depression women. A negative correlation was found between Edinburgh postpartum depression score and the serum zinc levels.

It is of importance that women are educated about their health. If we are to alleviate depression by correcting zinc level, for example, it is not enough that supplements are prescribed and the patient is sent home. It should be explained to them why they are being requested to take them, and the consequences of failing to follow through. This process cannot be left up to healthcare professionals

alone. Individuals should offer support to their family members when in need and keep an eye on loved ones who may be suffering and trying to hide. As a community we must come together to fight the problem one step at a time.

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