ORIGINAL ARTICLE

DEPRESSION AND PLASMA OXYTOCIN LEVELS IN MOTHERS HAVING CEREBRAL PALSY CHILDREN

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Background: Children suffering from cerebral palsy (CP) experience many medical, social and psychological problems. Their family members, undertake a lot of difficulties emotionally, physically, socially, and economically. The study aimed to estimate the severity of depression in mothers looking after children suffering from severe CP and compared their depression scores with the scores of mothers having healthy children. Depression scores were correlated with the plasma oxytocin levels of the mothers. **Methods:** This cross-sectional comparative study included 21 mothers having children suffering from severe CP and 21 controls. All mothers were below 40 years of age. Depression was estimated using the Beck Depression Inventory (BDI). Plasma oxytocin was measured using Enzyme-Linked Immunosorbent Assay (ELISA). **Results:** A statistically significant difference was observed between the mean scores of BDI II between the two groups (p=0.011). By applying the Spearman correlation test, depression scores showed a negative significant correlation with the plasma oxytocin levels. **Conclusion:** Mothers having CP children are more prone to depression than mothers having healthy children. The significant negative correlation of plasma oxytocin levels with depression scores suggests its predictive role in depression and its use in adjunct therapy in treatment plans.

Keywords: BDI II, Cerebral Palsy, Depression, Oxytocin

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INTRODUCTION

Depression, the common mental illness, affects more than 322 million people around the globe.[1] During 2005 to 2015, the number of people living with depression increased by 18.4% making it the second leading global burden of disease.[1,2] Mothers having cerebral palsy (CP) children are prone to depression. CP is a non-communicable, commonest, disability of childhood caused by the brain hypoxia, has a global prevalence of 1.4–4 per 1,000 live births.[3] In Pakistan, District Swabi, KPK has a prevalence of CP at 1.22/1,000 live births.[4] Out of 160 cases in Faisalabad, presenting with abnormalities of posture, tone, and movement, 75% were suffering from CP.[5] There are increased chances of CP in cases with preterm delivery, intrauterine infection, congenital malformations or anomalies, birth defects, foetal growth restriction, multiple pregnancies, placental abnormalities, prolonged labour, and instrumental delivery.[6] The economic burden of children with CP exceeds far beyond the needs of healthy children adding to the physical and mental stress to their parents.[7] Mothers of these children are even under greater stress. Multiple studies were conducted to assess depression and effects of CP on the quality of life (QoL) of the mothers having children suffering from CP.[8,9] Higher depression and stress scores have been observed in mothers compared to fathers or parents of healthy controls.[3]

Oxytocin is a hormone secreted from hypothalamus and released from the posterior pituitary gland, and is strongly associated with social behaviour, affiliation, and stress.[10] It has a basal plasma level of 200–359 pg/mL in non-pregnant, non-lactating women.[11] Depressed women have lower plasma oxytocin levels compared to healthy women.[12] Multiple trials have shown a positive role of intranasal oxytocin as an adjunct treatment in depression.[13]

The present study aimed to investigate the effects of having CP children on maternal depression, and plasma oxytocin levels, and to compare it with healthy controls. It highlights the need of psychiatric support to improve the quality of life of the child, parents, and the family.

MATERIAL AND METHODS

This cross-sectional comparative study was conducted from Feb to Dec 2020. The Ethical Review Board of University of Health Sciences Lahore reviewed and approved the study (UHS/REG-19/ERC/1863), and the Institutional Review Board of Children Hospital/ Institute of Child Health Lahore also approved the study.

The study was conducted in Lahore, Pakistan. A total of 42 mothers aged up to 40 years were recruited from the Children Hospital, Lahore. Mothers were further divided into two groups of 21 each. Group I: mothers with age <40 years, having a child suffering from severe CP. Group II: mothers with healthy children. Gross Motor Functional Classification System (GMFCS) was used as a diagnostic tool and level V was taken as severe CP in children.[14] Sample size was calculated with WHO calculator, estimates were derived

based upon a previous study[15]. All pregnant or lactating mothers, mothers using steroid therapy, oral contraceptive pills or medication for depression were excluded. Women with any chronic medical condition were also excluded. The purposive sampling technique was used.

Well recognized self-reported measures with acceptable psychometric properties were utilized after consultation with the consultant psychiatrist. Depressive symptoms were assessed using BDI-II.[16,17] Demographic profile of subjects, past medical or drug history, and family history was collected on specially designed datasheets. History about antenatal visits, duration of pregnancy, mode of delivery, the delayed cry of the newborn, infections in neonate and family history of CP was also taken to rule out the cause of CP.

Serum bilirubin, total protein, alanine transaminase (ALT) and creatinine were measured on MicroLab-300 (Merck, New York). Modification of Diet in Renal Disease study equation (MDRD) was used to estimate the Glomerular Filtration Rate (GFR).[18,19] Random blood sugar (BSR) was measured on AccuCheck® glucometer. These investigations were carried out only to assess the liver and kidney functions to exclude any chronic disease.

Plasma oxytocin level was measured with ELISA. Venous blood samples were collected between 8 AM to 11 AM to avoid fluctuations due to circadian rhythm of the hormone.[20] Estimation of oxytocin was performed within 10 days of sampling on unextracted plasma sample with the commercially available ELISA kit (Elabscience Biotechnology Inc. USA).

Data were entered into Microsoft Excel and analysed using SPSS-25. Shapiro-Wilk test was applied to check the normality of data. Descriptive statistics were used to analyse the demographic data and other parameters. Mean±SD was given for the quantitative variables. Frequencies and percentages were given for qualitative variables. Student's *t*-test was applied to compare BSR between groups. Mann-Whitney test was applied to compare BMI, BDI scores and plasma oxytocin levels between the groups, Spearman correlation test was applied to find any association of the oxytocin levels with BDI scores, and $p \leq 0.05$ was taken as statistically significant.

RESULTS

This study included 42 women, 21 in each groups. No significant differences existed between the ages of mothers in the groups (p=0.103). All participants belonged to middle socioeconomic class. Among cases, only 2 children reported CP in their first-degree relatives. Twelve of the cases reported prolonged labour and 9 reported home delivery by midwives.

The differences in levels of BSR between the two groups were statistically significant (p=0.024). The BDI scores for depression among mothers taking care of CP children were significantly higher than in mothers taking care of healthy children (p=0.011). In mothers taking care of children suffering from severe CP the plasma oxytocin was lower than in mothers taking care of apparently healthy children, but this difference was not statistically significant. (Table-1).

Table-1: Comparison of study parameters in groups (Mean±SD)

Parameters	Group I (n=21)	Group II (n=21)	*p*
BDI score	7.57±5.33	4.62±5.12	0.011*
Plasma Oxytocin (pg/mL)	115.60±40.30	139.92±70.11	0.571

*Statistically significant

Among mothers having CP children 17 had minimal depression, 3 had mild depression and 1 had moderate depression. Out of 21 subjects in the control group II, 19 had minimal depression, 1 had mild and 1 had moderate depression. (Table-2). Depression scores showed a negative significant correlation with plasma oxytocin levels both in cases and controls (Table-3, Figure-1, 2).

Table-2: Depression in group I and II [n (%)]

Severity of Depression	Mothers with CP children (n=21)	Mothers with healthy children (n=21)
Minimal	17 (80.95)	19 (90.47)
Mild	3 (14.28)	1 (4.76)
Moderate	1 (4.76)	1 (4.76)
Severe	0 (0)	0 (0)

Table-3: Correlation of BDI score with plasma oxytocin levels in group I and II

	Group I (n=21)		Group II (n=21)		Total (n=42)	
Parameters	BDI	Plasma oxytocin	BDI	Plasma oxytocin	BDI	Plasma oxytocin
rho	1.00	-0.785	1.00	-0.486	1.00	-0.612
P	0.001*		0.026*		0.001*	

*Statistically significant

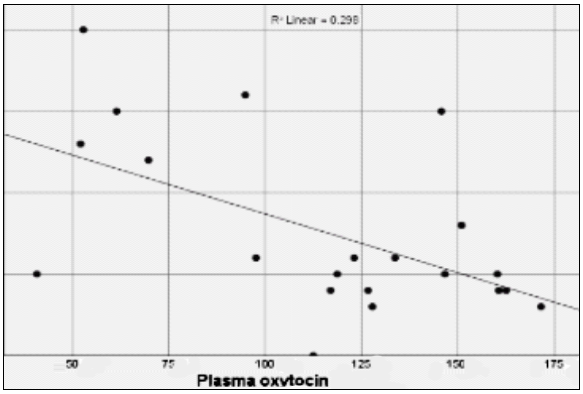

Figure-1: Scatter graph showing negative significant correlation between BDI scores and plasma oxytocin levels in mothers taking care of healthy children (n=21)

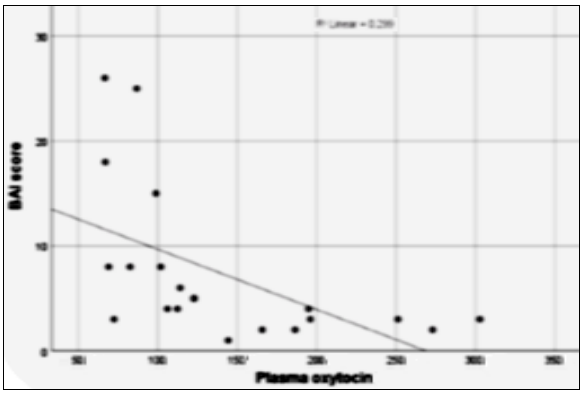

Figure-2: Scatter graph showing negative significant correlation between BDI scores and plasma oxytocin levels in mothers taking care of children suffering from CP (n=21)

DISCUSSION

This study included 21 mothers with healthy children and 21 mothers having children suffering from severe CP. The BDI scores were significantly higher in mothers taking care of CP children as compared to the mothers having apparently healthy children. A study[21] reported similar results to our study, the higher BDI II scores and low quality of life was observed in mothers having CP children. Previous studies[22,23] reported significantly higher levels of BDI scores in mothers having CP children than the control group. Mothers having CP children are depressed and severity can be categorized as mild, moderate and severe.[24] Results of our study are consistent with the above-mentioned studies. Studies suggest that CP children's mothers had a high prevalence of depression and anxiety that had a negative impact on children quality of life.[25,26] Studies conducted earlier suggest that factors like increase in age of mother as well as child, poor spousal support, lack of support from the family, unemployment and low education seemed to aggravate depression in these mothers. However, having another child with normal health and development, good family support and living in joint families served as protective factors. Presence of associated problems like epilepsy in the child, low intelligence, the severity of paralysis, motor disabilities, feeding issues and behavioural problems along with poor toilet training worsened the depression scores in mothers looking after the children suffering from CP.[27] Higher BDI scores were also observed by Altindag *et al*[15].

Physical disability in the child negatively affects the life of the mother. Maternal depression levels have a negative correlation with functional independence measurement and positive correlation with Gross Motor Function Classification System (GMFCS) scores in the CP child. Presence of CP child in a family is associated with maternal depression, musculoskeletal pain and negatively impacts the quality of life.[28] Increased psychological strain can be the triggering factor for the development of depression among mothers of CP children. Detailed history suggests that possible factors causing stress in mothers included in our study could be because of disabled child, behavioural problems or any other ailment associated with the child, limited leisure time, improper sleep, lack of family support, the social or economic burden. Anxiety and depression usually overlap each other in symptoms and treatment.

In our study plasma oxytocin levels showed a negative significant correlation with the BDI scores in both cases and controls. Literature shows a significant negative correlation between oxytocin and depression.[12,29]

Scarce literature is available to correlate plasma oxytocin levels in mothers having CP children. Our study correlates depression with the plasma oxytocin levels in mothers having CP children. It highlighted the need of psychological and social help for the mother taking care of CP children and emphasized on the need for the provision of proper medical facilities to the mother during pregnancy, during delivery and after birth. The study may help for future advancements about oxytocin and its use as a biomarker for prediction, prognosis, and treatment of depression.

CONCLUSION

Mothers taking care of CP children are more depressed as compared to the mothers taking care of healthy children. The significant negative correlation of plasma oxytocin with depression suggests its role as a predictor of depression. Further studies with large sample size are recommended. Awareness of the family and society, about the need for psychological help and need of social and family support to the mother having CP child is highly recommended.

LIMITATIONS

The study was a cross-sectional study which was conducted on a relatively smaller number of subjects, therefore it is hard to establish the exact cause-effect relationship.

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SAAHB: Literature search and data interpretation
AJ: Data collection, Analysis, Proofreading and review
AQ: Literature, Review and proof reading

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