

Use of edinburgh postnatal depression scale for early prediction of postpartum depression - a prospective study.

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Introduction

Pregnancy along with the perinatal period is arguably the transformational and vulnerable period in a women life and it is a complex timeframe where the women faces several changes, in particular an increased risk of the onset or worsening of psychiatric illness, including mood disorders, anxiety disorders and psychosis. The most important period is the first three months postpartum, with many chronic disorders starting before pregnancy and persisting throughout pregnancy into the postpartum period [1]. The association between the postpartum period and mood disturbances has been noted since the time of Hippocrates [2].

Postpartum psychiatric disorders can be divided into three categories: postpartum blues; postpartum psychosis and postpartum depression [3, 4]. Postpartum blues usually resolves in a few days to week, has only few negative sequelae and it requires only reassurance. Globally, the incidence of postpartum blues is 300–750 per 1000 mothers. On the other hand, postpartum psychosis is a severe disorder which usually begins within four weeks postpartum with a global prevalence ranging from 0.89 to 2.6 per 1000 and it requires hospitalization [5]. Similarly, postpartum depression is also a severe condition and it could start soon after childbirth or it could occur as a continuation of antenatal depression and it needs treatment immediately. The global prevalence of postpartum depression is estimated to be 100–150 per 1000 births [6]. Majority of epidemiological studies reported that the time period for onset of postpartum depression, ranges from 3 months to up to 12 months after delivery [7, 8]. The prevalence of postpartum depression is estimated to be 7.4–18.6% in various studies [9–12]. The prevalence is found to be particularly higher in the southern parts of the country with an estimated pooled prevalence of 26% when compared to the other parts of the country [13].

According to the World Health Organization (WHO), depression is a leading cause of disability in women and a major public health concern [14, 15]. Perinatal mental illness is largely under-diagnosed, and undertreated [16]. The signs and symptoms of postpartum depression are generally the same as those associated with major depression occurring at other times, including depressed mood, anhedonia and low energy and in severe cases presents with suicidal ideation.

The etiology of all psychiatric disorders, including postpartum depression is a complex interaction of psychological, social and biological factors, including the effect of genetic and environmental influences [17] (Figure 1).

The most important of them all is the psychological factors in which a woman has to adjust to changes in her body image, her relationships with her husband and family members, her responsibilities and the manner in which she is perceived by the society [18, 19]. The biological changes could be explained by the marked decrease in the gonadal steroids, progesterone and estrogen immediately after delivery. Estrogen primarily affects the monoaminergic system, especially serotonin and dopamine; influencing affective symptoms and psychotic symptoms respectively [20–22].

The risk factors associated with the development of postpartum disorders are Primigravida; unmarried mother; cesarean sections or other perinatal complications; past history of psychiatric illness, especially past history of anxiety and depression; family history of psychiatric illness, especially mother and sister having postpartum psychiatric disorder; previous episode of postpartum psychiatric disorder; stressful life events especially during pregnancy and near delivery; history of sexual abuse; vulnerable personality traits and social isolation/unsupportive spouse [23,24].

Considering the above features, there is a need for search of techniques for screening of these disorders, as the screening of postpartum depression is not only of utmost importance but also it is difficult. Several questionnaires have been validated for postpartum depression, including the Edinburgh Postnatal Depression Scale (EPDS). EPDS is the most widely used screening tool and it is validated under different conditions. Higher the score, greater the likelihood of depression. Originally, a score of 13 or greater was validated as the optimal cut-off score for diagnosing major depression [25], but subsequently the ideal cut-off score has been varied between 8–13 [26, 27].

Despite the mandate for universal screening for Post partum depression [28], little information exists on optimal interval and frequency of screening. The potential adverse effect of postpartum depression upon the maternal-infant relationship and child development reinforces the need for early identification and effective treatment models. Unfortunately, there are few studies of public health interventions that can

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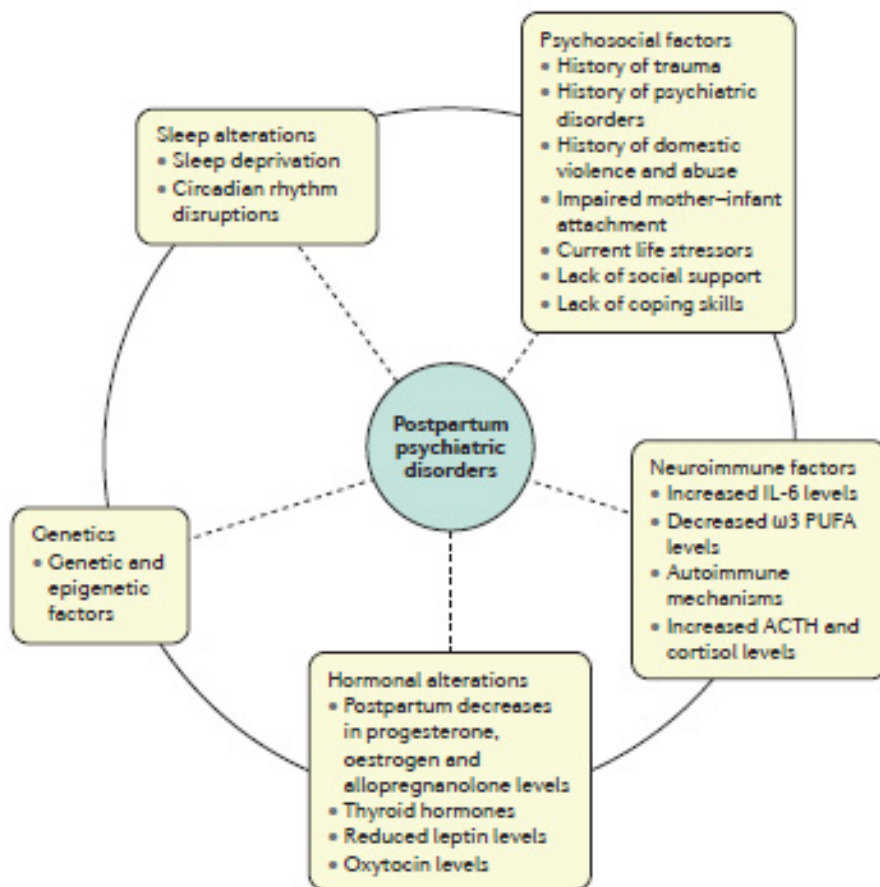


Figure 1: Etiology of Postpartum Psychiatric Disorders.

prevent or mitigate the impact of postpartum depression on these outcomes. A few studies, of variable quality, have explored the impact of interventions such as home visiting, telephone counseling, interactive coaching, group interventions, and massage therapy. The results of these studies are still very preliminary and must be interpreted with caution. Furthermore, the usefulness of EPDS scores on identifying the postpartum depression immediately after delivery should be explored, which could help in starting the intervention early, and can aid in the prevention of unfavorable outcomes, both for the mother and the child; thereby improving the physical and mental health status of the family and the community altogether. This is particularly important in a resource limited setting like India. Hence this study was conducted to determine the predictive validity of EPDS in identifying postpartum depression 2-3 days after delivery, the factors associated with postpartum depression and the effectiveness of early intervention in reducing the prevalence of postpartum depression among postnatal mothers in a tertiary care centre, Calicut.

Aim and Objective

Among the postnatal mothers who delivered in the department of Obstetrics and Gynaecology in a tertiary care centre, Calicut.

1. To determine the validity of Edinburgh Postnatal Depression Scale (EPDS) in early prediction of postpartum depression
2. To determine the factors associated with postpartum depression

3. To assess the effectiveness of intervention, in those patients with high EPDS score early postpartum period

Review of Literature

The review of literature is discussed under the following headings

1. Screening tools for postpartum depression
2. Validity of EPDS questionnaire in early prediction of postpartum depression and the effect of intervention
3. Factors associated with postpartum depression

Screening tools for postpartum depression

Standardized interviews

Schedule of Affective Disorders and Schizophrenia (SADS)

The SADS consists of open-ended questions concerning each symptom with probes for follow-up questions [29]. There are 11 depressive symptoms (seven somatic and four cognitive affective) in the eight categories of appetite disturbance, sleep disturbance, fatigue, loss of interest, guilt, impaired concentration, suicidal ideation, and motor disturbance. The presence and severity of each symptom is rated from 1 to 6 and a symptom must receive a rating of at least 3 (mild) or higher (severe and experienced often) and have been experienced for a minimum of two weeks to be considered clinically significant. The time for administration is approximately 90

minutes and it has been widely employed in many studies of postpartum depression [30, 31].

Standard Psychiatric Interview (SPI)

The SPI (also referred to as the Clinical Interview Schedule; CIS) is a semi-structured interview intended for use in community surveys [32]. The SPI is shorter than other standardized interviews and consists of questions designed to elicit the presence or absence of 10 defined psychiatric symptoms. The interviewer rates the presence of another 12 manifest abnormalities of mental state. Each symptom receives a score on a 5-point scale of severity and the total score is the sum of 10 symptom ratings added to twice the score of the manifest abnormalities. The interview has often been modified by adding items concerning appetite changes and weight loss to allow RDC to be applied. The SPI has been used postpartum [33].

Present State Examination (PSE)

The PSE is a semi-structured clinical interview that determines whether or not defined psychiatric symptoms have been present in the previous four weeks [34]. The interview results are used to classify cases according to the PSE-Index of Definition-Catego (PSE-ID Catego). The index specifies the degree of certainty with which a respondent may be considered a case, by using eight levels each of which implies greater confidence in case classification; level 5 is considered the threshold that divides cases from non-cases. The criteria used to determine the presence of symptoms are more stringent than are those in the SPI; hence, the SPI could include lower levels of psychiatric morbidity that would not reach the recommended threshold for the PSE. The PSE has been used in a number of postpartum depression studies [35].

Clinician rated scales

Hamilton Rating Scale for Depression (HRSD)

The HRSD (also referred to as the Hamilton Depression Rating scale - HDRS) was originally developed to assess the severity of depression among diagnosed patients and was intended as a means of qualifying expert clinical judgement [36]. The original HRSD consists of 17 depressive symptoms, eight of which relate to somatic complaints, and other versions are available ranging up to 31 items. Responses are rated on either a 3 or 5-point scale with a total score ranging from 0 to 50; a cut-off score of 15 and above is suggestive of major depression. It is also one of the scales which had been used widely for generalized depression and also for postpartum depression and it had been validated by many studies across the globe [37, 38].

Montgomery-Asberg Depression Rating Scale (MADRS)

The MADRS was developed as an observer rating scale and consists of 10 items [39]. The items are primarily concerned with psychological symptoms of depression and include global ratings of disturbance and social functioning. Each item is rated in severity from 0 to 6 with a total score ranging from 0 to 60; scores between 7 and 18 indicate mild depression, although some studies have used a cut-off level of 11. While

the MADRS has been used by several postpartum depression researchers, it has been associated with a high false positive rate and scores should be confirmed with more reliable methods [40, 41].

Self-reported questionnaires

Beck Depression Inventory (BDI)

BDI is one of the most commonly used self-reported questionnaires, which consists of 21 items [42]. It assesses affect, cognitive symptoms, behaviors, somatic complaints, and interpersonal domains to measure the presence and intensity of depressive symptoms [43]. Items inquire about mood over the past 7 days and are rated on a 4-point scale ranging from 0 to 3, with higher scores indicating lower mood. While a cut-off score of 12/13 for screening and 20/21 for clinical research has been recommended and many studies have used a cut-off score of 15/16, other researchers have preferred a range of scores with 0 to 9 indicating no symptomatology, 10 to 20 signifying mild depression, 21 to 30 representing moderate depression, and over 30 suggesting severe depression [44]. The score has been modified for postpartum women for the assessment of depression. (The performance of the BDI-II with postpartum women was recently assessed producing acceptable results [45].

Patient Health Questionnaire-9 (PHQ-9)

PHQ-9 is a self-administered version of the Primary Care Evaluation of Mental Disorders (PRIME-MD) diagnostic instrument for common mental disorders [46]. The PHQ-9 is the depression module, which scores each of the nine DSM-IV criteria as "0" (not at all) to "3" (nearly every day). It has been validated for use in primary care [47].

Edinburgh Postnatal Depression Scale (EPDS)

EPDS is the most widely used instrument in postpartum depression studies and for population-based screening. It is a 10-item self-report scale specifically designed to screen for postpartum depression in community samples. Each item is scored on a 4-point scale (from 0-3), with a total score ranging from 0 to 30 and it includes questions related to maternal feelings during the past seven days and refers to depressed mood, anhedonia, guilt, anxiety, and suicidal ideation. One advantage of this scale is that it does not include common somatic symptoms such as insomnia and appetite changes, which may occur naturally in postpartum women. The EPDS is not a substitute for a full clinical evaluation but rather a high score is indicative that further assessment is warranted. A cut-off score of 13 is validated and generally considered suggestive of postpartum depression.

Validity of EPDS questionnaire in early prediction of postpartum depression and the effect of intervention

Knights JE et al conducted a retrospective cohort study to determine the predictive validity of the early Edinburgh Postnatal Depression Scale (EPDS) score (done within 96hours after delivery) in diagnosing postpartum depression when compared to the late EPDS score (done at outpatient postpartum visit). It was found that the EPDS scores remained

the same or improved in 92.2% (189/205) of women. The 16 women whose scores worsened were more likely to have had a diagnosis of prior psychiatric illness (50% vs 16.4%, $p=0.003$) and/or a diagnosis of fetal anomaly (12.5 vs 1.6%, $p=0.05$). An early EPDS score of <10 had a 92.7% probability of maintaining low risk screening (EPDS <10) at a later time [48].

Teissède F et al conducted a study among 1154 women to evaluate the effectiveness of the Edinburgh Postnatal Depression Scale (EPDS) in the first days postpartum to detect women who will suffer from postnatal depression (4-6 weeks postpartum). There was a highly significant positive correlation between EPDS scores on both occasions (Spearman rank correlation: $r = 0.59$, $P < 0.0001$). The cut-off scores of 10 and 11 for EPDS administered at 2 to 3 days obtained good specificity, sensitivity, and positive predictive values for the cut off scores proposed for the diagnosis of postnatal depression at 4 to 6 weeks postpartum [49].

El-Hachem C et al conducted a study among 228 Lebanese women to determine the utility of EPDS score measured on second day of postpartum in diagnosing the depression between 20 and 40 days postpartum and also to determine the risk factors and prevalence of postpartum depression. On second day, the average score on EPDS was 7.1 (SD = 5.2) and 33.3% of women had an EPDS score ≥ 9 . On day 30-40 postpartum, the average score was 6.5 (SD = 4.7) and 19 women (12.8%) presented with PPD. A positive correlation was shown between scores on EPDS on second day and day 30-40 ($r = 0.5091$, $p < 0.0001$). A stepwise regression showed that an EPDS score ≥ 9 on day 2 ($p < 0.001$) and a personal history of depression ($p = 0.008$) are significantly associated with the diagnosis of PPD on day 30-40 [50].

Yamashita H et al conducted a multicentric prospective cohort study among 226 women in 14 obstetric wards to determine the utility of EPDS scores in predicting the postpartum depression early. Seventy-nine out of the 226 patients (35%) had maternity blues. Forty six out of the 226 patients (20%) had postnatal depression (EPDS being 9 or more) at one month postnatally. There was a significant correlation between the EPDS scores on the 5th postnatal day and those at one month. Having maternity blues and higher than 9 or more of the EPDS score were significantly related to the EPDS scores of 9 or more at one month postnatally. (OR: 4.4 and 13 respectively). Dysphoria on fifth day was significantly related to history of pregnancy loss, Caesarean section, Maternal and neonatal complications and Maternity blues. Dysphoria on one month was only related to maternal complication [51].

Levis B et al conducted a meta-analysis to evaluate the Edinburgh Postnatal Depression Scale (EPDS) for screening to detect major depression in pregnant and postpartum women. Literature search was performed using Medline, Medline In-Process and Other Non-Indexed Citations, PsycINFO, and Web of Science (from inception to October 2018). Individual participant data were obtained from 58 of 83 eligible studies (70%; 15 557 of 22 788 eligible participants (68%), 2069 with major depression). Combined sensitivity and specificity was maximized at a cut-off value of 11 or higher across reference

standards. Among studies with a semi-structured interview (36 studies, 9066 participants, 1330 with major depression), sensitivity and specificity were 0.85 (95% CI: 0.79 to 0.90) and 0.84 (95% CI: 0.79 to 0.88) for a cut-off value of 10 or higher, 0.81 (95% CI: 0.75 to 0.87) and 0.88 (95% CI: 0.85 to 0.91) for a cut-off value of 11 or higher, and 0.66 (95% CI: 0.58 to 0.74) and 0.95 (95% CI: 0.92 to 0.96) for a cut-off value of 13 or higher, respectively [52].

Dennis CL conducted a study in which a population-based sample of 594 mothers completed the Edinburgh Postnatal Depression Scale (EPDS) at 1, 4 and 8 weeks postpartum. The sensitivity, specificity and predictive power of the 1-week EPDS in relation to identifying mothers with elevated EPDS scores at 4 and 8 weeks was determined. The predictive power of the 1-week EPDS was further assessed using odds ratios and receiver operator characteristic (ROC) curves. At one week postpartum, 29.5% of mothers scored >9 on the EPDS, decreasing to 23% at 4 weeks and 20.5% at 8 weeks. Using the cut-off score of 9/10, the 1-week EPDS accurately classified 85.4% mothers at 4 weeks and 82.5% mothers at 8 weeks with or without postpartum depression symptomatology. The one week EPDS significantly correlated to the 4-week ($r=0.72$, $P<0.001$) and 8-week ($r=0.65$, $P<0.001$) EPDS. Mothers with a 1-week EPDS score >9 were 30.3 times more likely at 4 weeks (95% CI=17.5-42.3) and 19.1 times more likely at 8 weeks (95% CI=11.0-32.9) to exhibit postpartum depression symptomatology [53].

Evins GG et al conducted a study to compare the efficacy of routine clinical evaluation with the Edinburgh Postnatal Depression Scale for the detection of postpartum depression among 391 women. The incidence of postpartum depression detection with the Edinburgh Postnatal Depression Scale was significantly higher than the incidence of spontaneous detection during routine clinical evaluation (35.4% and 6.3%, respectively; $p=0.001$). It was concluded that the EPDS screening was effective in the diagnosis of postpartum depression as compared to the routine clinical examination [54].

Castañón SC et al conducted a review of medical records of 100 women to determine the efficacy of EPDS in the detection rates for depressive symptoms in the postpartum period and also to determine the feasibility and acceptance of the scale for the routine screening purposes. The spontaneous detection rate for depressive symptoms was 4.6% (5/110). In 26.4% of women in whom the instrument was applied, 15% had a postpartum depression. The application rate of the scale was 88% and the rate of acceptance by mothers was 100%. It was concluded that the EPDS scale significantly improved the detection rate of postpartum depression with a good acceptance rate among the women and the professionals [55].

Ferguson SS et al conducted a study to determine the efficacy of the Edinburgh Postnatal Depression Scale when compared to the routine clinical evaluation to detect postpartum depression and to evaluate risk factors associated with a positive score on the Edinburgh Postnatal Depression Scale. A total of 72 women participated in the study: 35 women in the routine evaluation group and 37 women in the Edinburgh

Postnatal Depression Scale group. Women who completed the Edinburgh Postnatal Depression Scale were significantly more likely than those in the routine evaluation group to be identified as being at risk for depression: 11 of 37 women (30%) versus 0 of 35 women ($p < 0.001$). A failed attempt at breast-feeding was associated with an increased risk of Edinburgh Postnatal Depression Scale (RR: 3.78; 95% CI:1.03-13.89) [56].

Appleby L et al conducted a study to assess the predictive validity of EPDS score by administering the questionnaire to antenatal mothers at 36 weeks of gestation and eight weeks postpartum. It was found there was a significant correlation between the antenatal EPDS scores and the postnatal EPDS scores. The scores, in particular were able to identify the mothers who would not become depressed. Women who reported previous or current treatment for depression were at a threefold greater risk of becoming or remaining depressed postnatally.

In a prospective longitudinal study conducted by Johanson R et al, 58 417 pregnant women completed the EPDS antenatally and at 12 weeks postpartum. A cut-off > 14 was used for the diagnosis of postpartum depression and it was found 41 (9.8%) women during pregnancy and 31 (7.4%) at 12 weeks postpartum were identified with depressive symptomatology. There was a significant association between antenatal and postpartum depressive symptomatology. Seven (22.6%) of the 31 women who were depressed postnatally had also been depressed antenatally [57].

Teissedre F et al conducted a study to determine the predictive value of postpartum depression at three days postpartum and to determine a cut-off score for major depression. The EPDS was administered to 859 mothers at three days postpartum and it was found that the mean EPDS score was 6.4 (SD=4.6); 258 (30%) mothers had an EPDS score, 9. 82.6% of these mothers experienced a natural childbirth and 17.3% a caesarean section; 51.5% gave birth to their first child, 36.2% to their second child and 12.3% to their third or more. The questionnaire was again administered to the mothers at 4-6 weeks postpartum and it was found that 131 mothers had an EPDS score 11 (mean age=30.3; SD=4.8). They had an EPDS mean score of 13.6 (SD=3.3). Mothers with probable depression were interviewed and assessed, using the Neuropsychiatric Interview, the SIGH-D (Structured Interview Guide for the Hamilton Depression Scale) and the BDI (Beck Depression Inventory) in order to diagnose a major depressive episode. They had a HDRS mean score of 13.7 (SD=5.1) and a BDI mean score of 13.6 (SD=5). At three days postpartum, it was found that 258 mothers (30%) had an EPDS scores 9 and 164 mothers (19%) had an EPDS scores 11. Between 4 and 6 weeks postpartum, we observed 18.1% of postpartum depression (EPDS 11) and 16.8% (EPDS 12) of major postpartum depression. The analysis of the sensitivity and the specificity at 3 days postpartum provided a cut-off score of 9 (Sensitivity: 0.88) (Specificity: 0.50) as predictive of postpartum depression, for this cut-off score. The analysis of the sensitivity and the specificity between 4 and 6 weeks postpartum provides a cut-off score of 12 (Sensitivity: 0.91 and Specificity: 0.74) for the detection of major postpartum

depression. Factor analysis shows at 3 days postpartum, that the internal structure of the scale is composed of two subscales. The first factor F1 "anxiety" accounts 28% of the variance and the second factor F2 "depression" accounts 20% of the variance. Between 4 and 6 weeks postpartum, factor analysis suggested an unidimensional model in the evaluation of postpartum depression which is better than a two factor model. This factor accounts 40% of the variance. The scale has a good predictive value, and we can observe a significant correlation with the EPDS periods 1 and 2 ($r=0.56$; $p < 0.05$). This result showed that the depressive mother's mood intensity predicts a future depressive risk. Furthermore, correlations between EPDS and BDI ($r=0.68$; $p < 0.05$) and EPDS and HDRS ($r=0.67$; $p < 0.05$) show a good convergent validity. The reliability study confirms the good internal consistency of the EPDS, at 3 days postpartum and in the postpartum depression -symptomatology evaluation (Cronbach's Alpha > 0.80) [59].

Yamashita H et al conducted a study to determine the predictive validity of EPDS questionnaire in predicting the postpartum depression early among 88 women. It was found that, 12 mothers were diagnosed with postnatal depression and 10 of these had their onset within one week. At the second interview, three additional mothers were newly diagnosed with depression. In all mothers, depression was detected at one month using the EPDS, with a cut-off of 8/9. The EPDS scores on the fifth postnatal day were also higher in the depressed mothers and could detect early onset of postnatal depression [60].

Guedeny N et al published a brief report on the concerns of EPDS questionnaire in detecting the postpartum depression early by analyzing the results of 87 women who were administered this questionnaire. It was found that, out of 23 women with postpartum depression, the scale missed three cases of the postnatal depression. These three missed cases were also assessed by a semi-structured interview (Present State Examination). Comparisons between EPDS scores and the scores of two other self-report questionnaires (the General Health Questionnaire-28 and the Center for Epidemiologic Studies-Depression Scale) suggested that EPDS was better at identifying depressed postnatal women with anhedonic and anxious symptomatology rather than those whose depression presents mainly with psychomotor retardation [61].

Jardri R et al conducted a study among 811 postnatal mothers to validate the use of the Edinburgh Postnatal Depression Scale (EPDS) in the early postpartum, and to identify the markers for risk of postnatal depression. The sensitivity of EPDS was measured as 0.82 [0.78-0.86], with a positivity threshold of 9.5/30. For an estimated prevalence for all depressive episodes of 16.1%, the positive predictive value of EPDS was measured as 42.8% [39.1-46.5%]. Multivariate risk analysis using logistical regression identified the following as risk markers for postnatal depression: previous history of depression (postnatal or other), unemployment, premature delivery or stopping breast-feeding in the first month for non-medical reasons [62].

Chabrol H et al conducted a study among 299 women completed the Edinburgh Postnatal Depression Scale (EPDS)

at 2-3 days and 4-6 weeks postpartum to determine the predictive validity of the scale. There was a highly significant positive correlation between EPDS scores at both occasions (Spearman rank correlation: $r=0.61$, $p=0.0001$). Exploratory factorial analyses extracted three factors which were called 'anxiety', 'depressive mood', and 'anhedonia'. A multiple regression analysis entering factor scores at 2-3 days showed that the 'anxiety' factor was the main significant predictor of 4-6 weeks EPDS scores. The correlation between the 'anxiety' factor scores derived from 2-3 days EPDS and 4-6 weeks EPDS total scores was very strong (Spearman rank correlation: $r=0.84$, $p=0.0001$). The 'anxiety' factor was the only significant predictor of the clinical diagnosis of postnatal depression. These results suggest that the EPDS completed at 2-3 days postpartum is a useful means of screening for women at risk of postnatal depression [63].

Hannah P et al in her study employed the Edinburgh Postnatal Depression Scale (EPDS) among 217 patients at five days and six weeks postpartum. There was a highly significant positive correlation ($r=0.60$; $p<0.001$) between the two scores, together with similar symptom profiles. Of the 25 women who suffered post-natal depression (6-week EPDS score greater than or equal to 13), 17 had similar symptoms in the first week post-partum (5-day EPDS score greater than or equal to 10). Low birth weight of the baby, delivery by Caesarean section, a delivery much more difficult than expected, and bottle feeding were all significantly associated with a high EPDS score in the first week post-partum. Bottle feeding and delivery by Caesarean section were the only factors associated with depression at the sixth week. A recollection of low mood after a previous birth was also associated with postpartum depression after the current birth. This, together with an EPDS score of 13 or more at five days post-partum, increased the risk of postpartum depression at six weeks 85-fold [64].

Lane Aet al conducted a study to determine the predictive validity of EPDS in diagnosing the disorder early. Predictors of mood disturbances were measured at 3 days and 6 weeks postpartum among 242 Irish mothers. Eleven percent of mothers ($n = 24$) had EPDS scores above 12 at 3 days and at 6 weeks postpartum. While factors associated with a high EPDS score at six weeks postpartum included single status, unemployment, unplanned pregnancy, public status, and bottle-feeding, the strongest predictor was maternal EPDS score at three days [65].

Chen H et al conducted a prospective cohort study to determine the usefulness of EPDS questionnaire in detecting the postpartum depression early and the effect of intervention among the patients detected early with the score. Among 1369 women, 9% (126) were found to have postpartum depression. Forty-one women accepted intervention and achieved 78% reduction in the EPDS scores to below the cutoff of 13, 76% had improvement in Global Assessment of Functioning (GAF) scores and 68% had improved health quality scores.

Factors associated with postpartum depression [66].

Sheela CN et al conducted a prospective cohort study among 1600 postpartum women to determine the prevalence of

postpartum depression using EPDS score and also to assess the factors associated with postpartum depression. The prevalence of an EPDS score of ≥ 13 in our population was 7.5% (120/1600). Participants with a family history of psychiatric illness, history of domestic abuse, delayed initiation of breastfeeding, and those who gave birth to a female infant were at a significantly higher risk for an EPDS score of 13 or higher, indicating probable postpartum depression. The mode of delivery, NICU admission of the newborn, and history of antenatal complications were not significant risk factors [67].

Govender D et al conducted a cross-sectional study among 326 women to determine the prevalence of depression and its associated risk factors among pregnant and postpartum adolescents in KwaZulu-Natal, South Africa between June and November 2017. The prevalence of depression among the pregnant participants was 15.9% (21/132), whereas it was 8.8% (17/194) among the postpartum participants. Antenatal depression was associated with physical violence (adjusted odds ratio (aOR) 6.47, 95% CI 1.36-30.53, $p = 0.01$) and verbal abuse (adjusted odds ratio (aOR) 4.8, 95% CI 1.5-15.16, $p = 0.006$). The pregnant participants who indicated they received a lot of support from their partners were 0.93% less likely to have depression. Postnatal depression was associated with physical violence (adjusted odds ratio (aOR) 7.32, 95% CI 1.66-29.44, $p = 0.005$), verbal abuse (adjusted odds ratio (aOR) 4.3, 95% CI 1.03-15.79, $p = 0.03$), and intimate partner violence (adjusted odds ratio (aOR) 9.58, 95% CI 1.58-48.82, $p = 0.008$) [68].

Al Nasr RS et al conducted a cross sectional study among 174 mothers to determine the prevalence of postpartum depression (PPD) in Riyadh and to determine the factors associated with postpartum depression. The mothers were administered with EPDS and the prevalence was ascertained. Of 174 participants of the study, 38.50% ($n = 67$) reported postpartum depression. Significant association was noted between occurrence of PPD with unsupportive spouse ($p= 0.023$) and recent stressful life events ($p = 0.003$). On regression analysis, unsupportive spouse (OR = 4.53, $p= 0.049$), recent stressful life events (OR = 2.677, $p= 0.005$), and Caesarean section as a mode of delivery (OR = 1.958, $p= 0.049$) were found to be the significant predictors [69].

Materials and Methods

Study Design and Setting

A hospital based prospective cohort study was conducted in the Department of Obstetrics and Gynecology, MIMS Hospital, Calicut, Kerala.

General Setting

Kozhikode, also known as Calicut, is an Indian city, second-largest urban city in the State of Kerala and 20th largest in the country with a population of two million according to 2011 census. The district is bordered on the North by Kannur district, on the East by Wayanad district, on the South by Malappuram district and on the West by the Arabian Sea (Figure 2).

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Specific Setting

Aster Malabar Institute of Medical Sciences Ltd (MIMS) is one of the leading healthcare systems in Malabar, assures comprehensive health care services with a global standard. The 600-bedded multispecialty hospital is renowned for its excellent medical expertise, nursing care and quality diagnostic services. The department of Obstetrics and Gynaecology at MIMS Hospital, Calicut is backed by exceptional care from a skilled team of doctors and surgeons and latest academic research. The comprehensive healthcare services at the hospital include reproductive medicine, obstetrics, maternal-fetal medicine, breast care program, gynecological cancer program, gynecological infectious diseases, osteoporosis and anesthesiology. The doctors at the hospital are well-equipped to address all the problems suffered by women, right from adolescence to menstrual health, menopause and after menopause. The baby-friendly initiative of the hospital aids in providing optimal level of care to both the mother and child where information is provided to mothers on baby care, hygiene standards, breast-feeding and baby health.

Study Duration

The study was conducted for a period of one and half years from September 2019 to April 2021.

Study population.

All postnatal mothers who delivered in the department of Obstetrics and Gynaecology in ASTER-MIMS, Calicut were included for the study.

Inclusion criteria

1. Postnatal mothers 1- 2 days postpartum
2. Postnatal mothers 6weeks postpartum

Exclusion Criteria

Postnatal mothers

1. With a previous history of psychiatric disorder
2. On any psychiatric medication
3. Who were critically ill in peripartum period

Sample Size and Sampling

Based on the correlation co-efficient (r) of EPDS score at 2-3 days postpartum with EPDS score at six weeks postpartum as 0.59,49 with 80% power at 95% confidence level the sample size was estimated to be 275 postnatal mothers using nMaster 2.0. The final sample size was estimated to be 303 postnatal mothers, after assuming a loss to follow up of 10%.

Sample Size for Correlation Coefficient Analysis

Sample correlation coefficient = 0.59

Population correlation coefficient = 0.69

Power (%) = 80%

Alpha Error (%) = 5%

Required sample size = 275



Figure 2. Study general setting (map).

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The consecutive postnatal mothers were included for the study after fulfilling the eligibility criteria based on purposive sampling until the sample size was reached.

Study Tools

Section A: A semi-structured proforma was used to collect the socio-demographic and the obstetric characteristics of the study participants.

Section B: A validated Edinburgh Postnatal Depression Scale (EPDS) (Cronbach's alpha =0.79) was used to assess postpartum depression. It is a 10-item self-report questionnaire with a minimum score of 0 and a maximum score of 30 (**Table 1**). The score of 13 was found to have a sensitivity of 86% and a specificity of 78%.25 Domains assessed in each question are as follows [70-72].

Study Procedure

After obtaining ethics approval from the institute ethics committee and informed consent form the postnatal mothers, socio-demographic and the obstetric characteristics were collected using a semi-structured proforma. Following this, a detailed physical examination was done. The mothers were then given EPDS questionnaire within 2-3 days of delivery and the scores were obtained.

When the EPDS score was found to be ≥ 13 , the mothers were counseled for intervention for postnatal depression. The willing mothers were then enrolled for the intervention and were counseled by inhouse psychologist Dr Chandramukhi. All the mothers were provided with a contact number in case of any occurrence of new symptoms or aggravation of the presenting symptoms.

All the mothers were reassessed six weeks postpartum, during their time of last postnatal check up using the EPDS questionnaire and the scores were tabulated.

Operational Definition

Postnatal depression: EPDS score of ≥ 13 at six weeks postpartum

Study Variables

Independent variables

1. Age of the mother in years
2. Parity
3. Mode of delivery

4. Occupation
5. Socioeconomic status
6. Spouse support
7. Gender of the baby
8. NICU admission
9. EPDS scores (2-3 days and six weeks postpartum)

Outcome Variables

1. Correlation of EPDS score at 2-3 days postpartum with EPDS score six weeks postpartum
2. Validity of EPDS score 2-3 days postpartum
3. Effect of intervention on patients with higher EPDS score 2-3 days postpartum
4. Factors associated with postpartum depression

Statistical Analysis

Data was analyzed using SPSS V21 for Windows. Categorical variables like parity, gender of the child are expressed as frequency and percentages. Continuous variables like age of the mother, EPDS scores are expressed as mean (SD) or median (IQR), based on its type of distribution. Spearman's rank-order correlation was used to express the correlation between the EPDS score 2-3 days postpartum and the EPDS score six weeks postpartum. The validity of the EPDS score 2-3 postpartum is presented as sensitivity, specificity, positive and negative predictive values. Chi square test and independent samples t test was used to determine the association for the factors predicting postpartum depression. The effectiveness of the intervention was assessed using Mann Whitney signed rank test. A p value of less than 0.05 was considered statistically significant.

Approval of Research Review Board

The ethical approval was sought from the Institutional Ethics Committee (IEC). Informed consent was obtained from the patients before data collection. Confidentiality was maintained by limiting the identifying variables to the minimum. Data was analyzed in aggregate and access to the collected data was limited only to me, my guide and co-guide.

Analysis and Results

A total of 303 pregnant women were included in the study. The mean age of the study participants was 27.1 (3.6) years and the

Table 1: Assessment of Emotional and Psychological Symptoms.

Items	Domain Assessed
1 & 2	Anhedonia
3	Self blame
4	Anxiety
5	Fear or panic
6	Inability to cope
7	Difficulty sleeping
8	Sadness
9	Tearfulness
10	Self harm ideas

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median age was 27.0 (24.0-29.0) years with a minimum of 18 years and a maximum of 36 years. The flow of the study participants is shown in the (Figure 3).

* Effectiveness of the intervention was determined (n=28)

#Correlation of the EPDS at 2-3 days postpartum with the EPDS at six weeks postpartum (n=275)

Table 2 and Figure 4 shows that seven (2.3%) women presented with teenage pregnancy.

Table 3 and Figure 5 show that majority (52.1%) of the pregnant women was primiparous and 47.9% of the pregnant women were multiparous.

Table 4 and Figure 6 show that more than 2/3rd (70.6%) of the pregnant women delivered by Caesarean section.

Table 5 and Figure 7 show that nearly 2/3rd (66.3%) of the pregnant women included in our study were either unemployed or were housewives.

Table 6 shows that 47 (15.5%) of the pregnant women belonged to the lower socioeconomic status. It was also found that support from the spouse (abroad or out of station) was absent among 16.2% of the pregnant women.

Table 7 shows that more than half (51.8%) of the newborns were males and about 16.8% of the infants were admitted in the NICU after delivery.

Table 8 shows that 17.5% (95% CI: 13.5%-22.3%) of the study participants were found to have symptoms predictive of postpartum depression using EPDS at 2-3 days postpartum.

Table 9 shows that postpartum depression was found to be significantly lower as the age of the mother increased ($p<0.001$).

Table 10 shows that the postpartum depression, as predicted by the EPDS score at 2-3 days postpartum was found to be

higher among the primiparous women (22.0% vs 11.5%) and it was found to be statistically significant ($p=0.018$).

Table 11 shows that the postpartum depression was significantly higher among the mothers who were unemployed/housewives (23.4% vs 5.9%; $p<0.001$).

Women who deliver by caesarean delivery were found to have higher prevalence of postpartum depression at 2-3 days after delivery when compared to those who delivered by normal vaginal delivery (21.5% vs 7.9%) and it was found to be statistically significant ($p=0.004$) (**Table 12**).

Table 13 shows that postpartum depression at 2-3 days of delivery was found to be significantly higher among women with lower socioeconomic status ($p<0.001$). Similarly, women with lack of spouse support was found to be suffering from the symptoms of postpartum depression significantly higher when compared to those women with spouse support ($p<0.001$).

Table 14 shows that postpartum depression at 2-3 days of delivery was significantly higher for the mothers of whom the infant was admitted in the NICU ($p<0.001$). However, there was no significant association between the gender of the baby and postpartum depression ($p=0.098$).

Table 15 shows that there was a strong positive correlation between the EPDS at 2-3 days postpartum and EPDS at six weeks postpartum and it was found to be statistically significant ($r=0.691$; $p<0.001$).

Table 16 shows the predictive validity of EPDS at 2-3 days postpartum in diagnosing postpartum depression. It was found that it had a sensitivity of 81.2% and a specificity of 95.4%. Positive and negative predictive values were found to be 52.0% and 98.8% respectively.

Table 17 shows that there was a significant reduction in the EPDS scores at six weeks among those who accepted intervention in the form of counselling among women with EPDS ≥ 13 at 2-3 days postpartum ($p<0.001$) [73].

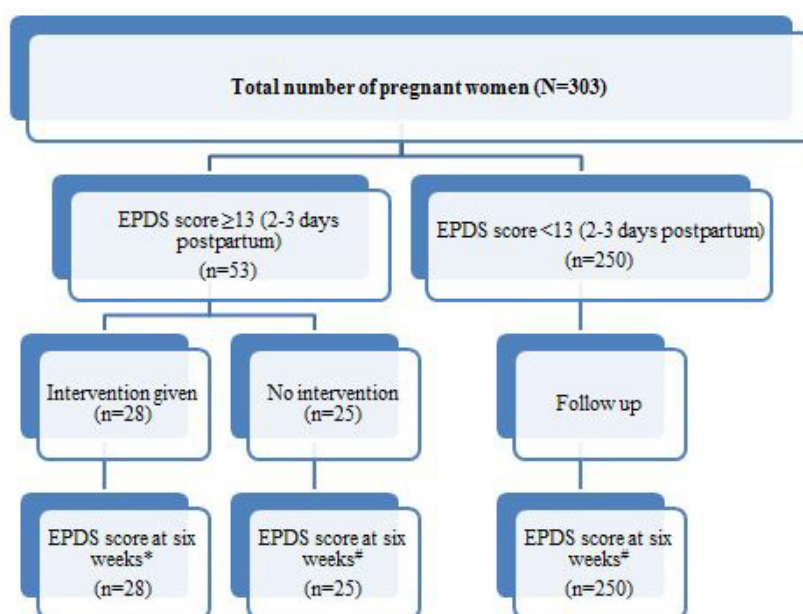


Figure 3: Flow of the study participants.

Table 2: Age distribution of the study participants (N=303).

Age category (years)	Frequency (n)	Percentage
≤19	7	2.3
>19	296	97.7
Total	303	100

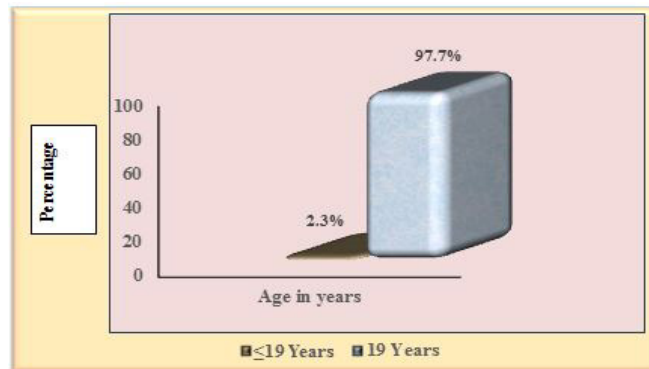


Figure 4: Age distribution of the study participants (N=303).

Table 3: Distribution of the study participants by parity (N=303).

Parity	Frequency (n)	Percentage
Primi	173	57.1
Multi	130	42.9
Total	303	100

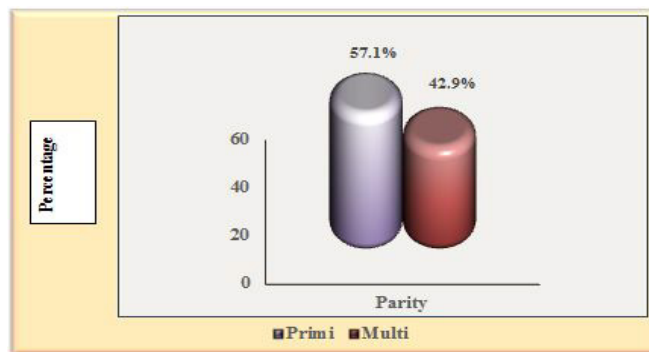


Figure 5: Distribution of the study participants by parity (N=303).

Table 4: Distribution of the study participants by mode of delivery (N=303).

Mode of delivery	Frequency (n)	Percentage
Normal vaginal delivery	89	29.4
Caesarean delivery	214	70.6
Total	303	100

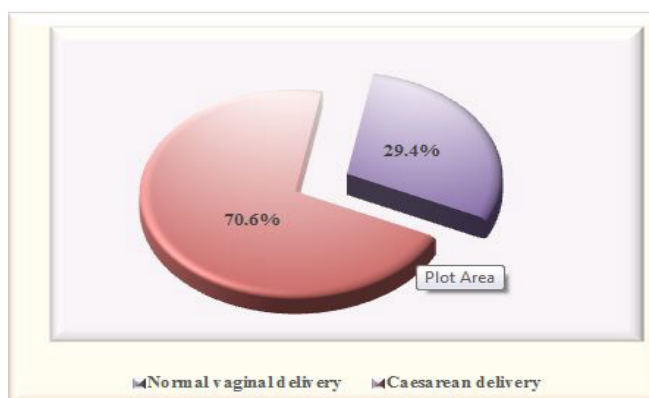
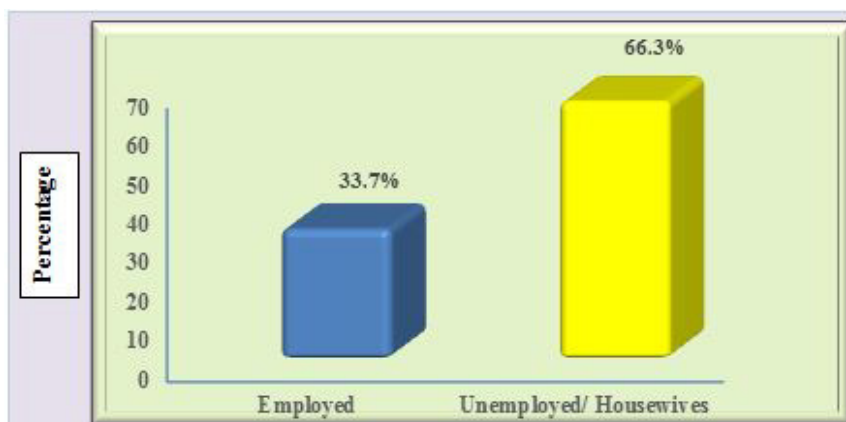


Figure 6: Distribution of the study participants by mode of delivery (N=303).

Table 5: Distribution of the study participants by occupation (N=303).

Occupation	Frequency (n)	Percentage
Employed	102	33.7
Unemployed/Housewives	201	66.3
Total	303	100

**Figure 7:** Distribution of the study participants by occupation (N=303).**Table 6:** Distribution of the study participants by socioeconomic status and spouse support (N=303).

	Frequency (n)	Percentage
Socioeconomic status		
Lower	47	15.5
Middle/Upper	256	84.5
Spouse support		
Present	254	83.8
Absent	49	16.2

Table 7: Distribution of the study participants by newborn characteristics (N=303).

	Frequency (n)	Percentage
Gender of the baby		
Male	157	51.8
Female	146	48.2
Obstetric outcome		
NICU admission	51	16.8
Normal	252	83.2

Table 8: Prevalence of postpartum depression by EPDS questionnaire at 2-3 days postpartum (N=303).

Postpartum depression (EPDS at 2-3 days postpartum)*	Frequency	Percentage (95% CI)
Yes	53	17.5 (13.5-22.3)
No	250	82.5 (77.6-86.5)

*EPDS ≥ 13 at 2-3 days postpartum

Table 9: Association of age of the mother with postpartum depression by EPDS questionnaire at 2-3 days postpartum (N=303).

Postpartum depression (EPDS at 2-3 days postpartum)	Age of the mother in years		pvalue
	Mean	SD	
Yes	24.6	4	<0.001
No	27.6	3.3	

Table 10: Association of parity with postpartum depression by EPDS questionnaire at 2-3 days postpartum (N=303).

Parity	Postpartum depression (EPDS at 2-3 days postpartum)		pvalue
	Yes n (%)	No n (%)	
Primi	38 (22.0)	135 (78.0)	0.018
Multi	15 (11.5)	115 (88.5)	

Table 11: Association of occupation of the mother with postpartum depression by EPDS questionnaire at 2-3 days postpartum (N=303).

Occupation	Postpartum depression (EPDS at 2-3 days postpartum)		pvalue
	Yes n (%)	No n (%)	
Employed	6 (5.9)	96 (94.1)	<0.001
Unemployed/Housewives	47 (23.4)	154 (76.1)	

Table 12: Association of mode of delivery with postpartum depression by EPDS questionnaire at 2-3 days postpartum (N=303).

Mode of delivery	Postpartum depression (EPDS at 2-3 days postpartum)		pvalue
	Yes n (%)	No n (%)	
Normal vaginal delivery	7 (7.9)	82 (92.1)	0.004
Caesarean delivery	46 (21.5)	168 (78.5)	

Table 13: Association of mode of delivery with postpartum depression by EPDS questionnaire at 2-3 days postpartum (N=303).

	Postpartum depression (EPDS at 2-3 days postpartum)		pvalue
	Yes n (%)	No n (%)	
Socioeconomic status			
Lower	22 (46.8)	25 (53.2)	<0.001
Middle/Upper	31 (12.1)	225 (87.9)	
Spouse support			
Present	28 (11.0)	226 (89.0)	<0.001
Absent	25 (51.0)	24 (49.0)	

Table 14: Association of newborn characteristics with postpartum depression by EPDS questionnaire at 2-3 days postpartum (N=303).

Newborn characteristics	Postpartum depression (EPDS at 2-3 days postpartum)		pvalue
	Yes n (%)	No n (%)	
	Gender of the newborn		
Male	22 (14.0)	135 (86.0)	0.098
Female	31 (21.2)	115 (78.8)	
	Obstetric outcome		
NICU admission	27 (52.9)	24 (47.1)	<0.001
Normal	26 (10.3)	225 (89.7)	

Table 15: Correlation between the EPDS at 2-3 days postpartum and EPDS at six weeks postpartum (N=275).

	Correlation coefficient (r)	p value*
EPDS at 2-3 days postpartum*	0.691	<0.001
EPDS at six weeks postpartum		
	*Spearman correlation	

Table 16: Predictive validity of EPDS at 2-3 days postpartum in the diagnosis of postpartum depression (N=275).

Postpartum depression (EPDS at 2-3 days)	Postpartum depression (EPDS at six weeks)	
	Yes (n)	No (n)
	13	12
	3	247
Sensitivity= 81.2%		
Specificity= 95.4%		
Positive predictive value= 52.0%		
Negative predictive value= 98.8%		

Table 17: Effect of intervention on EPDS score at six weeks postpartum among the patients with higher EPDS (≥ 13) at 2-3 days postpartum (N=28).

EPDS score	Median (IQR)	p value*
2-3 days postpartum	16.0 (16.0-17.75)	<0.001
Six weeks postpartum	11.5 (10.25-14.0)	
	*Mann-Whitney Signed Rank Test	

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Discussion

In recent years, even though universal screening is recommended for postpartum depression, the exact timing and the interval for screening is still a point of argument. However, screening is mandated not only because it is easier but also it prevents from psychological consequences of the mother following delivery. Moreover, the success of screening is dependent on the follow-up care and the effective intervention for the same. Hence it became imperative to conduct a study to determine the validity of EPDS questionnaire in identifying the postpartum depression early and also to determine the effect of intervention on the patients with higher score in screening.

Our study showed that 17.5% (95% CI: 13.5%-22.3%) of the study participants had symptoms predictive of postpartum depression using EPDS at 2-3 days postpartum. A study by El-Hachem C et al⁵⁰ had reported that 33.3% of the postpartum mothers had depressive symptoms by EPDS score in early postpartum period. The proportion is higher when compared to our study and it could be well argued that the reported difference could be due to the fact that a cut-off of ≥ 9 was considered in their study and hence the higher rate of postpartum depression. However a study where a higher cut-off similar to our study was used, 15.9% of the study participants had a higher score which is comparable to our study.⁶⁸ A study by Chandran M et al⁷³ had reported a prevalence of 11% in the rural parts of Tamilnadu. The condition once believed to be lesser in India is on a rise due to rapid urbanization coupled with the changing socio-cultural pattern. In contrast, a study by Chen H et al⁶⁶, had reported PPD to be present in 9% of the postpartum mothers [74].

In order to reduce the false positives by screening, it is always advisable to assess the risk factors for the condition. With regards to factors contributing to the postpartum depression, there was a significant association for mother of younger age, primiparity, lower socioeconomic status, unemployed / housewife, lack of spouse support during pregnancy, caesarean delivery and NICU admission with postpartum depression at 2-3 days following delivery. It is a known fact that child bearing at a younger age makes the mothers more vulnerable for mental breakdown which could result in postpartum blues and postpartum depression. With regards to employment, even the studies conducted by Jardis R et al⁶² and Lane A et al⁶⁵ also had reported unemployment as an independent predictor of postpartum depression. Unemployment has been looked upon as a potential predictor in various other studies. One another important predictor was lack of support from the spouse during pregnancy. Similar observations were reported by a study conducted by Al Nasr RS et al⁶⁹, where postpartum depression was associated with the mothers of unsupportive spouse. Family support and care is vital for the wellbeing of patients undergoing physical trauma, chronic illness and so many physiological complications in life. The stage of life during pregnancy in general and postpartum in particular, necessarily be handled delicately by associated members of family. A supportive spouse is essential to prevent any untoward incident that may harm mother or her child. It has

been found that partners who participate in daily activities, childcare behavior, and helping in regular follow ups with hospitals, result in reducing the onset of depression or obviating depression among their spouse.⁷⁴ The study also reported that stressful life events could also lead to postpartum depression. The stressful life events are discrete quantifiable situation that can have a severe negative impact on psychological status which can increase the risk of depression.⁷⁵ The impact of stressful life event on the development and exacerbation of somatic disorders, ⁷⁶chronic illness⁷⁷ are well described. Since the mother's body undergoes series of changes during the process of gestation and parturition, presence of stressful life event may work as a trigger for developing depression. Hence lack of family support, spouse support could well be a stressful event during pregnancy for the mother which could result in postpartum depression. Even the personal history of depression had been reported as a predictor of postpartum depression by various other studies [75].

Our study also found that caesarean section and NICU admission as predictors of postpartum depression. Studies by Yamashita H et al⁵¹, Hannah PP et al⁶⁴ and Al Nasr RS et al⁶⁹ also had supported our study results. The study by Yamashita H et al⁵¹ also had reported that history of abortions, maternal and neonatal complications, as predictors of postpartum depression. However, Sheela CN et al⁶⁷ in her study had reported that mode of delivery, NICU admission and antenatal complications were not associated with postpartum depression. Various other studies also had reported that failed attempt of breast feeding to be a potential predictor of postpartum depression.

There was significant strong positive correlation between the EPDS at 2-3 days postpartum and EPDS at six weeks postpartum ($r=0.691$; $p<0.001$) with a sensitivity of 81.2% and a specificity of 95.4%. Positive and negative predictive values were found to be 52.0% and 98.8% respectively. A study by Knights JE et al⁴⁸, had a sensitivity of 92.7% when the EPDS score cut-off was fixed at <10 . The study also established that the symptoms either remained the same or it improved at six weeks postpartum in 92.2% patients who were identified early postpartum, by EPDS score. Studies by Teissedre F et al⁴⁹, El-Hachem C et al⁵⁰, Yamachita H et al⁵¹, Chabrol H et al⁶³ and Hannah P et al⁶⁴ had also reported a strong positive correlation between the EPDS score 2-3 days postpartum and at 4-6 weeks postpartum. The similar findings were observed by studies conducted elsewhere.⁵³ A meta-analysis by Levis B et al⁵² have also supported our study results in which the overall pooled sensitivity and specificity were comparable to our study findings. Studies evaluating the correlation between the scores at antenatal and postpartum period also had supported our study findings by establishing a strong positive correlation. Hence it could be well argued that the EPDS score 2-3 days postpartum could be a good predictor of postpartum depression at six weeks. However clinical significance is also needed for more robustness of our study findings [76].

There was a significant reduction in the EPDS scores at six weeks postpartum, among women who underwent intervention in the form of counseling, among women with EPDS ≥ 13 at

2-3 days postpartum ($p < 0.001$). Similar results were observed in a study conducted by Chen H et al [66], where there was a 78% reduction in EPDS symptoms when intervention in the form of counseling was given to the patients with a higher EPDS score at 2-3 days postpartum. However, the studies are limited with a less sample size to confirm our results.

One of the major strengths of our study is that the study included a representative sample of population and the study was a cohort study with a follow-up which potentially decreased the selection bias and the information bias which could have been encountered by other study designs. However some of the other variables like behavioral history which could be an independent predictor could not be collected which could be a limitation of the study. Another limitation is that the patients were not looked upon for clinical improvement at six weeks, which if it was done could have made our study more generalizable. As in any study about screening of psychiatric disorder-----Our study suggests that implementation of EPDS earlier has a good validity in predicting women with postpartum depression; although it warrants clinical significance. Further studies with a larger sample size are needed to increase the robustness of our study findings, in particular for the effects of intervention for postpartum depression [77].

Conclusion

1. Symptoms of postpartum depression were present in almost 1/5th (17.5%) of the study participants using EPDS at 2-3 days postpartum.
2. Implementation of EPDS earlier has a good validity in predicting women with postpartum depression.
3. Significant association for mother of younger age, primiparity, lower socioeconomic status, unemployment, lack of spouse support during pregnancy, caesarean delivery and NICU admission with postpartum depression.
4. Early intervention is found to be useful in bringing down postpartum depression.

Limitation

1. Patients were not looked upon for clinical improvement at six weeks, which if it was done could have made our study more generalizable.
2. Behavioral history which could be an independent predictor could not be collected.
3. Social desirability bias cannot be ruled out, since there is always a chance of participants giving desirable answers and it is commonly encountered in sensitive scales.

Recommendation

1. Further studies with a larger sample size are needed to increase the robustness of our study findings, in particular for the effects of intervention for postpartum depression.
2. Implementation of routine screening of all postnatal mothers using EPDS questionnaire for early prediction of postpartum depression.

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