Original Article

Screening for Postpartum Depression in a Neonatal Intensive Care Unit and Postnatal Ward with Its Impact on Newborn Care Practices: A Hospital Based Survey

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ABSTRACT

Introduction: Depression is the fourth leading cause of disability and is estimated to rise to second place by the year 2020. Women of child bearing age are at an increased risk of depression, with an even higher risk seen in postpartum period. Maternal depression adversely effects child's functioning in cognitive, social, and developmental areas including failure to thrive, and poor physical and emotional/behaviour development.

Aim: To find the prevalence and associated factors of Postpartum Depression (PPD) in mothers with hospital deliveries.

Materials and Methods: A hospital based cross-sectional study of 14 months duration was conducted recruiting mothers admitted in the postnatal ward, or having their newborn admitted in neonatal intensive care unit or neonatal intermediate care unit. All these mothers were screened for PPD using Gujarati version of Edinburgh Postnatal Depression Scale (EPDS). A separate questionnaire was used for assessing newborn care practices and some more factors that might be associated with PPD. Logistic regression applied for finding contributors for PPD.

Results: Two hundred and five mothers with a mean age of 25.6 (SD 4.82, range 17-42 years) participated in the study. A total of 48 had abnormal depression scores (23.4%). Mothers not exclusively breast feeding the children were observed to have 12 times higher odds of getting depression. The odds of depression in mother of a child not covered properly are 24 times more than the mother whose child is well covered with clothes.

Conclusion: The findings suggest that depression in mothers is associated with poor maternal infant feeding outcomes and care practices including covering the baby. Screening of mothers in early postpartum period is necessary for betterment of mother-baby unit.

INTRODUCTION

Postpartum depression approximately affects 15% of mothers [1]. The prevalence of PPD varies from 7-35% in different societies of the world with using different screening tools [2-4]. Apart from western societies, studies have been conducted in Africa [5], the Far East [6], Middle East [7] and India [8,9]. Up to 80% of mothers can also experience transitory self resolving symptoms such as fatigue and mood swings. Postpartum mental health issues is rightly regarded as the most common complication of childbirth, however it is largely underdiagnosed and undertreated [10].

There are several factors associated with development of PPD. One of the strongest predictors of PPD occurance and it's severity are 'presence of depression and anxiety' during pregnancy [11]. Relationship difficulties, family stress, lack of social support, financial stress, stressful life event, sex of the infant, multi-parity, maternal smoking and poor accommodation all were related to PPD [11,12]. The rate of PPD increases in mothers with infants admitted in NICU and in mothers of preterm infants [13,14].

The long-term impact of PPD on child's health is well documented [15,16]. Maternal depression adversely affects child's functioning in cognitive, social, and developmental areas including failure to thrive, poor physical and emotional/behaviour development [15,16]. Few studies have found associations between PPD and lack of confidence in child care and nursing [17,18]. Depressed mothers are less likely to continue breastfeeding [19]. These associations with immediate newborn care are not well studied. It is difficult to find at what time point an intervention would start to prevent the negative effect of PPD on breastfeeding. In a recent cross-sectional study done by Brown A et al., they found a significant negative correlation between duration of BF and EPDS score (Pearson's r = -0 267, p<0.001) [20].

The neonatal care providers and paediatricians have optimal opportunity to interact and develop relationship with mothers of infants. This when combined with the knowledge that there is a higher prevalence of PPD in mothers with newborns admitted in NICUs, justifies the need for neonatal care providers and paediatricians to identify symptoms of PPD to provide appropriate referral and support. The American Academy of Paediatrics recommends screening of mothers at 1, 2, and 4 month visits [21]. PPD screening in the NICUs and neonatal wards though advocated is not considered standard of care [14].

This study demonstrates the application of screening for PPD by paediatricians in a neonatal unit and postnatal wards of a tertiary care hospital in rural Western India. The objective of this study was to provide information on the prevalence, and associated factors of PPD in hospital deliveries.

MATERIALS AND METHODS

This was a cross-sectional hospital based study. A total of 205 mothers were approached in a duration of 14 months (July 2012 to August 2013). All participants that were approached, agreed to participate in the study. The project was approved by the Ethics Committee of the institute.

The study was carried out in Neonatal Intensive Care Unit, Neonatal Intermediate Care unit and postnatal ward of a tertiary care hospital.

Assuming a prevalence of PPD as 15% [1,22] and considering an acceptable difference of 5% with alpha level as 5%, the estimated sample size was calculated to be 196.

All mothers admitted in the postnatal ward, or had their newborn admitted in neonatal intensive care unit or neonatal intermediate care unit, who agreed to participate in the study were screened for PPD. A written informed consent was obtained from the respondent mothers before inclusion.

Study Tools

The EPDS is the most widely used screening tool for PPD. It was designed by Cox JL et al., in 1987 [23]. A previous review of 37 validation studies of the EPDS demonstrated a highly variable sensitivity (34 to 100%) and specificity (44 to 100%) [24].

We used a translated version of EPDS in local Gujarati dialect for screening mothers for PPD, translated into local dialect, back translated and pre-tested for face validity. The scale consisted of 10 items with four alternative answers for each. The mother was asked to choose the response that best described how she felt in the previous seven days. Responses were scored from 0 to 3 according to increasing severity of symptoms. The cut-off used in present study was taken as 9 or above, based on some other studies [25,26].

Questionnaire was self-administered among literate mothers and among illiterate mothers it was administered by the investigators. Due to feasibility issues we could not follow a fixed schedule of depression screening with reference to the number of postpartum days.

In addition, data on set of parameters that are routinely used for documenting newborn care practices were also collected and its association with PPD was looked for.

STATISTICAL ANALYSIS

Collected data were entered using Epi Info 7.0. It was converted into Statistical Package for Social Sciences (SPSS 14.0) format. Analysis was done using SPSS 14.0. Descriptive statistics was used to demonstrate utility of EPDS in the neonatal unit and postnatal wards. Univariate analysis was done and associations were found using chi-square test. Multivariable logistic regression was done to find independent associations of significant variables with depression status as the dependent variable. Significance was considered at p-value <0.05; and odds ratio was calculated.

RESULTS

A total of 205 mothers with a mean age of 25.6 (SD 4.82, range 17-42 years) participated in the study. One mother was of age 17 years while rest all were above 19 years of age. Detailed description of the sample with respect to the socioeconomic variables and medical characteristics is given in [Table/Fig-1,2] respectively.

Out of 205 mothers screened, 48 had abnormal depression scores (23.4%). The mother aged 17 was not found to be depressed. Two mothers had experienced previous episodes of depression and both were on antipsychotic medications. One of them had depression and other was normal. One mother had a still birth during the study period and suffered from possible depression. Among the 205 babies under study, six babies were born with some congenital anomaly, out of which four mothers suffered from PPD. Out of 205, 26 babies required NICU admission. Out of mothers of these 26 admitted babies 12 mothers suffered from depression. Five mothers did not have any support from the husband and four out of them had depression. Similarly, 36 mothers reported not having family support out of which 14 had depression. Five mothers out of eight with some family tension had depression. Child birth was associated with an adverse event in three cases, out of which one mother screened positive for depression.

Breastfeeding was commonly initiated early with 88.3% mothers breastfeeding within 24 hours (within 1 hour-32.7%; within 6 hours-75.1%). Exclusive breastfeeding was extensively practiced (89.7% of the mothers). Kangaroo Mother Care (KMC) was practiced by 40.5%

Socioeconomic characteristics	Mother Non-depressed	Mother Depressed	Total	p-value
Age of mothers				
<20	7	6	13	
20- <30	124	27	151	
30-<35	17	8	25	0.009
≥35	9	7	16	
Education of mothers				
None	30	10	40	
Primary	74	18	92	
Secondary	26	13	39	0.543
Higher Secondary	13	3	16	
Higher	14	4	18	
Occupation of mothers				
Housewife	117	40	157	
Labourer	32	5	37	0.231
Office job	6	1	7	
Professional	2	2	4	
Religion				
Christian	4	0	4	
Muslim	15	5	20	0.587
Hindu	138	43	181	
Education of Fathers				
None	14	5	19	
Primary	49	10	59	
Secondary	49	19	68	0.585
Higher Secondary	21	8	29	
Higher	24	6	30	
Occupation of fathers				
Unemployed	2	0	2	
Labourer	112	34	146	0.486
Office job	25	10	35	
Professional	18	4	22	
Family Income				
Rs.979 or less	9	4	13	
Rs.980-2935	39	16	55	
Rs.2936-4893	59	12	71	0.009
Rs.4894-7322	27	7	34	
Rs.7322-9787	9	4	13	
Rs.9787 or more	14	5	19	

[Table/Fig-1]: Socioeconomic characteristics of the participants by depression status of the mothers.

of the mothers. Most of the mothers gave KMC for 2-6 hours (45 out of 83). Fifteen mothers gave more than six hours and rest gave less than two hours. In weight categories other than normal KMC was given in 67.4% of the newborns who belonged to weight category other than normal. Some mothers of normal weight newborns also practiced KMC; 23 out of 92 normal weight newborns received KMC. A total of 92.7 % of the babies were found kept well covered.

On univariate analysis, PPD was significantly associated with maternal age (p-value=0.009), unsupportive husbands (p-value=0.011), unsupportive families (p-value=0.028), family tension (p-value=0.008), NICU/NIMC admission (p-value=0.006), congenital anomalies in newborn (p-value=0.01), breastfeeding initiation (p-value=0.001), exclusive breastfeeding (p-value <0.001) and keeping the baby well covered (p-value <0.001). KMC to low birth weight babies was not significantly prevalent in depressed mothers (p-value=0.337). There was no statistically significant difference observed between the mean birth weight {2.49 (0.5) vs. 2.47(0.6)}, number of days of hospital stay {5.77 (7.8) vs. 4.4 (4.26)}

Socioeconomic characteristics	Non-depressed	Depressed	Total	Univariate p-value
Sex of the baby				
Female	70	23	93	0.742
Male	87	25	112	
Birth weight category				
Extremely low birth weight (<1000 gm)	1	3	4	0.134
Very low birth weight (1000-<1500 gm)	11	2	13	
Low birth weight (1500-<2500 gm)	55	17	72	
Normal (2500-4200 gm)	90	25#	115	
Maturity				
Preterm	32	12	44	0.544
Term	125	35#	160	
Type of delivery				
Assisted vaginal	4	3	7	0.492
LSCS	77	22	99	
Normal Vaginal	76	23	99	
Order of pregnancy				
1	58	15	73	0.064
2-5	98	30	128	
>5	1	3	4	
Number of abortions				
None	142	40	182	0.331
1	11	6	17	
2 or more	4	2	6	
Pregnancy Planned				
No	73	29	102	0.101
Yes	84	19	103	
Admission required				
Yes	14	12	26	0.006*
no	143	36	179	
Support from husband				
No	1	4	5	0.011*
Yes	156	44	200	
Support from family				
No	22	14	36	0.028*
Yes	135	34	169	

[Table/Fig-2]: Socioeconomic characteristics of the participants by depression status of the mothers.
* Statistically significant
# The data for term-preterm and birth weight category for 1 baby was lost

Variable	Adj. OR	CI for adj. OR	p-value
Planned pregnancy			
Yes (ref)			
No	2.56	1.014-6.459	0.047
Was there any family tension			
Yes (ref)			
No	0.169	0.028-1.038	0.055
Exclusive BF*			
Yes (ref)			
No	12.355	1.669-91.472	0.014
BF* initiation Within hour (ref)			
in 1-6 hours	2.984	0.879-10.131	0.080
in 6-24 hours	8.864	2.178-36.079	0.002
On second day	4.934	0.078-313.731	0.451
On third day	18.919	1.072-333.833	0.045
After third day	4.428	0.022-894.392	0.583
Not initiated	0.910	0.071-11.746	0.943
Child well covered			
Yes (ref)			
No	24.45	4.928-121.329	0.001
Support from husband			
Yes (ref)			
No	10.729	0.883-130.389	0.063
Occupation			
House wife (ref)			
Labourer	0.227	0.056-0.923	0.038
Office work	0.555	0.049-6.290	0.634
Professional	5.564	0.393-78.762	0.204

[Table/Fig-3]: Results of multivariable logistic regression.
No depression - '0' and Depression - '1'
*BF: Breastfeeding

DISCUSSION

We observed the prevalence of PPD to be 23.4%. One of the participating mothers in the sample was reported to be below the legal age of marriage and she was found not positive for depression. While it may disturb a few people to have a girl below the legal age of marriage, we believe based on the customs in this region that this is a good sign to find only one mother below legal age in a rural area where the study was conducted. On univariate analysis, the depression was found significantly associated with maternal age, unsupportive husbands, unsupportive families, family tensions, newborn birth weight, NICU/NIMC admission, congenital anomalies in newborn, number of pregnancies, breastfeeding initiation, exclusive breastfeeding and keeping the baby well covered.

There is a large worlwide data on PPD. Summary of the meta-analyses on studies assessing risk factors and prevalence of PPD is given in [Table/Fig-4] [27,28]. A meta-analysis estimated the prevalence of depression in the postpartum period at 13.0% [28]. The rates of PPD that we found in present study (23.4%) are similar to those reported in relatively recent population and primary care studies in low-income countries [29,30] including India Goa [8] and Tamil Nadu [9]. Although, a recent study by Desai DN et al., on PPD in Gujarat, reported the prevalence to be 12.5 % however, this difference in the prevalence could probably be attributed to the setting differences and differnt study tools [31].

Planning of pregnancy, family tension, support from husband, maternal occupation, exclusive breastfeeding, early initiation of breastfeeding and covering of the baby were found associated with PPD on multivariable analysis. A summary of other Indian studies with observed significant risk factors is presented in [Table/Fig-5] [8,9,22,31-35].

as well as the mean weight at discharge {2.60 (0.6) vs. 2.57 (0.5)} of the babies according to the mother's depression status {normal vs. depressed} (p>0.05). There were about 31% mothers who reported having some or the other antenatal complications of which most common being anaemia (22%) followed by PIH (19%).

Multivariable logistic regression by backward LR method was done to find associations of possible aetiological factors and care practices with PPD with no PPD as the reference category. Factors included in the regression model were newborn illness, newborn weight, newborn age, newborn sex, maternal age, maternal education, maternal occupation, history of abortions, number of pregnancies, planning of pregnancy support from husband, support from other family members, history of family tension, family income, KMC given, exclusive breastfeeding, breastfeeding initiation and newborn kept well covered with clothes. This model so developed was able to correctly classify the outcome 84.7% times and explain 45.9 % variation in outcome variable (depression). The final iteration with the significant findings are presented in [Table/Fig-3].

Study	Sample size	Variables examined	Significance
O'Hara MW and Swain AM [27]	77 studies 12,210 subjects	**Sociodemographic**	Non-significant
		Clinical factors	
		Depression during pregnancy	Moderate/strong
		Prenatal anxiety	Moderate
		Previous history of depression	Moderate
		Family depression of depression	No association
		Obstetric and pregnancy complications	Small
		Psychological factors	
		Cognitive attributions	Small
		Neuroticism	Moderate
		Social factors	
		Life events	Moderate
		Social support	Moderate
		Marital status	No association
		Marital relationship	Small
		Income	Small
Beck CT [28]	84 studies 3000 subjects	**Clinical factors**	
		Depression during pregnancy	Moderate
		Prenatal anxiety	Moderate
		Maternal anxiety	Small
		Previous history of depression	Moderate
		Obstetric and pregnancy complications	
		Unplanned pregnancy	Small
		Infant related factors	
		Child care stress	Moderate
		Infant temperament	Moderate
		Psychological factors	
		Self-esteem	Moderate
		Social factors	
		Life stress	Moderate
		Social support	Moderate
		Marital status	Small
		Marital relationship	Moderate
		Socioeconomic status	Small

[Table/Fig-4]: Summary of meta-analyses.

Unplanned pregnancy as a risk factor should be interpreted with care. It mainly reflects mother's attitude towards the circumstances in which pregnancy occurred; not towards the growing foetus. Thus, an unplanned pregnancy does not mean, it is an unwelcome pregnancy. However, the woman has to deal with the ramifications of this unplanned event that will affect the rest of her life. Beck CT in her meta-analysis [28] found a small but significant association between an unplanned pregnancy and PPD. These results were supported by Warner R et al., who found a significant relationship between unplanned pregnancy and depression at six weeks postpartum [36]. We also observed significance on multivariable analysis (OR 2.56, CI (1.02,6.46); p-value=0.047).

Pregnancy and child birth are highly stressful life events on their own for a woman which may lead to depression. Any family tension/quarrel imparts additional stress at a vulnerable time for women. Earlier studies have demonstrated spousal and parental relationships as risk factors for PPD [37]. Beck CT assessed studies measuring perceived stress during pregnancy and early postpartum period

found a moderate relationship between perceived life stress and PPD [28]. Family tension may have overlapping and multiplicative role with lack of social support from family members and problems in marital relationship. We also observed that family tension and unsupportive families were significantly associated with PPD on univariate analysis. Similarly, having no family tension acts as a protective factor for PPD in logistic regression model (OR 0.169, CI (0.03,1.04); p-value=0.055)

The mother usually tends to do the greater share of parenting tasks, and the parents must accept their new roles and implement necessary changes in their routine. The relationship between the partners may suffer with the added burden of childcare. A supportive relationship with the father and rest of the family can help mitigate the stress of being a new mother. Same was shown in present study as mothers with unsupportive husbands had more chances of depression (OR 10.73, CI(0.883,130.39); p-value=0.063). Earlier, study found lack of support from spouse following delivery in depressed women [38]. Later, in a meta-analysis, O'Hara MW et al., looked at perceived support from the baby's father and found a moderate strength relationship [27]. Other Indian studies [9] also implicated spouse and family support as a significant risk factor for PPD.

Socioeconomic deprivation indicators such as unemployment, low income and low education have been cited as risk factors in mental health disorders. In their meta-analysis O'Hara MW et al., and Beck CT concluded that mother's occupation had a small but significant predictive relationship to PPD [27,28]. Recent studies, also found that unemployment was significantly associated with PPD [6,8,36]. We observed protective effect of employment (labour) over housewife for PPD (OR 0.227, CI (0.056,0.923), p-value=0.038). This can be attributed to better financial security. However, in contradiction higher odds of having depression (although not significant) were observed in mothers with professional job may be because of higher mental stress (OR 5.56, CI (0.393,78.76); p-value=0.204).

Mothers with PPD are more likely to have negative infant feeding outcomes-decreased breastfeeding duration, increased breastfeeding difficulties, and decreased exclusive breastfeeding [39]. Poor levels of breastfeeding self-efficacy should prompt the clinician to carefully screen for postnatal depression. We observed higher odds of exclusive breastfeeding (OR-12.355,CI -1.669-91.472; p-value=0.014) and early initiation of breastfeeding in non- depressed mothers. Interestingly, as the time of initiation of breastfeeding increased more than the one hour after delivery odds of having depression also increased, however breastfeeding initiation on day 2 and after day 3 did not follow the increasing trend. This probably reflects limitation of sample. Similarly, non-initiation of breast feeding was also not associated with PPD. This discrepancy can be explained by limitation of sample as well as this being a hospital based data so non-initiation of breastfeeding is also reflective neonatal complications (prematurity or illness).

The loss of breastfeeding self-efficacy in depressed mothers can be attributed to challenges and frustrations experienced by her in establishing effective breastfeeding. Depressed mothers often experience fatigue and sleep deprivations which are enhanced by breastfeeding. However, breastfeeding practices can also be affected by non-illness related factors such as the woman's preference or hospital policy.

Observing whether the newborn is well covered with clothes or not, can be linked to newborn care. We observed higher odds of PPD in mothers not keeping the baby not well covered with clothes (OR 24.45, CI (4.93,121.33); p-value=0.001).

This study demonstrates that EPDS can be used by the Paediatricians and neonatologists to screen mothers. The lack of knowledge and confidence amongst Paediatricians to diagnose PPD has been considered as a barrier for screening [40]. Although, maternal depression can be considered outside the scope of Paediatrics and

Study	Reference No.	Study population	Sample size (n)	Study tool	Prevalence of PPD	Significant associated Factors
Present study		Hospital based study	205	EPDS	23%	Unplanned pregnancy, family tension, no support from husband, maternal occupation, not exclusive breastfeeding, delay in initiation of breastfeeding and covering of the baby
Patel V et al.,	[8]	Antenatal/postnatal clinic patients	252	EPDS	23	Maternal employment, antenatal psychiatric morbidity, problems with breastfeeding the infant, infant hospital admission, sadness about the infant's gender
Chandran M et al.,	[9]	Community based study	384	CIS-R	11	Poverty, problems with in-laws, strained relations with parents, adverse life events during pregnancy, the birth of a daughter and lack of physical support after delivery
Gupta S et al.,	[22]	Community population attending postnatal clinics	202	PRIME MD Today	15.8%	Low level of education, low socioeconomic status, wanted son but delivered daughter, previous history of psychiatric illness, poor relationship with the family
Desai ND et al.,	[31]	Community population attending postnatal clinics	200	DSM IV -TR diagnostic criteria	12.5%	Multi-gravida, history of miscarriage, tense during her pregnancy, women who could not confide in their partners, girl child, mothers not having anyone, other than her mother and husband to confide
Sheela CN et al.,	[32]	Hospital based study	1600	EPDS	7.5%	Family history of psychiatric illness, history of domestic abuse, delayed initiation of breastfeeding and female gender of the baby
Gokhale AV et al.,	[33]	Hospital based study	200	EPDS	11% (Day 1) 7.4% (Day 6) 3.2% (6th week)	Birth of a female child, h/o miscarriage, feeling negative during pregnancy
Ghosh A et al.,	[34]	Hospital based study	6000	EPDS	25.1%	Low education, single motherhood, past history of psychiatric illness, poor obstetric, nuclear family structure, low socioeconomic status, history of abuse
Savarimuthu RJ et al.,	[35]	Community based qualitative study	137	SEMI (Short-explanatory model interview) Semi-structured clinical interview to identify depression EPDS	26.3%	Years of schooling less than five years, age less than 19 or over 30 years, thoughts of abortion in current pregnancy, low birth weight infant, unhappy marriage, antenatal physical abuse, postnatal physical abuse, husband abuses alcohol, subject also holds a job outside the home, family history of depression

[Table/Fig-5]: Indian studies on prevalence and risk factors of Postpartum Depression.

Neonatology however the effect it has on the newborn's outcome and discharge environment makes it an important factor to be considered. Such timely screening and referral by the Paediatricians will improve newborn care status and mental well being of mothers and is recommended by multiple studies [41,42].

LIMITATION

We accept the following limitations of present study. The lack of inference on some of the factors and heterogeneity of findings with relation to other studies can be attributed to small size of those variables. This being a hospital based study has limited generalisability. Since we had not followed our participants in their antenatal period, we cannot comment on antepartum depression and factors associated with it.

CONCLUSION

The prevalence of PPD in tertiary care hospital deliveries came to be 23.4%; which is in line with earlier data. The findings suggest that depression in mothers is associated with poor maternal infant feeding outcomes and care practices including covering the baby. Screening of mothers in early postpartum period is necessary for betterment of mother-infant unit. Further research is needed to describe the development strategies of a PPD screening program for mothers and assess the barriers in its implementation. Development of effective interventions and role of paediatricians also needs to be charted.

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