



**GENDER BIAS AND POSTPARTUM DEPRESSION TOGETHER  
MILITATE AGAINST BREASTFEEDING OF GIRLS**

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3 **GENDER BIAS AND POSTPARTUM DEPRESSION TOGETHER MILITATE**  
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6 **AGAINST BREASTFEEDING OF GIRLS: AN OBSERVATIONAL COHORT**  
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10 **STUDY**  
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## ABSTRACT

OBJECTIVES AND HYPOTHESIS: To examine influence of gender of baby on breastfeeding and incidence of postpartum depression (PPD) and their interrelationship. We hypothesize that in a society with a male gender bias there may be more PPD and less exclusive breastfeeding of girls.

DESIGN: Prospective study

SETTING: The study was conducted in an urban, tertiary hospital in Delhi.

PARTICIPANTS: Mothers delivering normally with their babies roomed-in. 1537 eligible women participated in the study.

PRIMARY AND SECONDARY OUTCOME MEASURES: Breast feeding and score on Edinburgh post partum depression scale (EPDS) was recorded.

RESULTS: 3,466 babies were born in the hospital. There were 792 girls for every 1000 boys. Among primiparous women sex-ratio was 901 girls per 1000 boys. In second babies the sex-ratio was 737:1000. If first child was a girl the ratio fell to 632. 1026 mothers were exclusively breastfeeding. Exclusive breast feeding of boys was significantly higher (70.8% vs 61.5%  $p < 0.001$ ). The EPDS score was significantly higher with birth of girls (EPDS  $6.0 \pm 3.39$  vs  $5.4 \pm 2.87$   $p < 0.01$ ). Women with EPDS  $< 11$  were less likely to breast feed ( $p < 0.01$ ).

CONCLUSION: The results point to a pro male gender bias evidenced by a low sex ratio at birth, higher EPDS score in mothers of girls and less breastfeeding of female children.

*IMPLICATIONS-* Mothers of girls may need more help to overcome postpartum depression/ postpartum blues and for improving breastfeeding rates. This in turn would enhance the survival of girl children and improve the sex ratio in the country.

AREAS FOR FURTHER RESEARCH: Studies in other populations are needed to confirm our findings. More studies are needed to elaborate the effect of sex bias on the duration of breastfeeding.

Further studies done later in the post natal period to examine how many of these mothers with high initial scores have longer lasting PPD.

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## **INTRODUCTION:**

Breast milk is the preferred food for all infants including premature and sick babies (1). UNICEF has promoted breastfeeding initiation within an hour of childbirth (2) (3). It provides nutritional, immunological, developmental, psychological advantages to the child besides health advantages to the mother and economic benefits to the family (1). It establishes skin-to-skin contact providing warmth to the newborn. Suckling at breast stimulates oxytocin release which further increasing flow of milk from breast. Breast milk reduces mortality in the first month of life (4). Early breast feed initiation is also associated with increased exclusive breastfeeding and longer duration of breastfeeding in following months (5). The WHO and UNICEF launched the baby friendly hospital initiative in 1991 to strengthen maternity unit practices to support breastfeeding (6). However in spite of all these promotions and the known benefits of breastfeeding, exclusive breastfeeding and early initiation of breastfeeding are not often practiced. Factors intrinsic to the mother or baby may play a crucial role. One such factor is post partum depression (PPD) and there is evidence that mothers with PPD are less likely to breastfeed (7) (8).

Expression of postpartum depression may extend from the more transient baby blues to a longer lasting depression going on for several weeks (9). In both conditions there are mood swings, crying jags, sadness, insomnia and irritability. (10, 11)

The 10-question Edinburgh Postnatal Depression Scale (EPDS) is a validated, valuable and efficient way of identifying patients at risk for perinatal depression. It can be applied for depression screening during pregnancy. (12) The scale has been used as early as 1<sup>st</sup> or 2<sup>nd</sup> postpartum day in order to screen women at risk

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3 of PPD, by Teissedre F. In his study 1154 women completed EPDS at 2 to 3  
4 postpartum days and again at 4 to 6 weeks postpartum. He found that there was  
5 a highly significant positive correlation between EPDS scores on the two  
6 occasions (Spearman rank correlation:  $r = 0.59$ ,  $P < 0.0001$ ) (13). Although the  
7 studies done in the immediate postpartum period are likely to pick up many  
8 cases of postpartum blues, Dennis found that mothers with a EPDS  $>12$  at 1  
9 week postpartum were significantly more likely at 4 and/or 8 weeks to  
10 discontinue breastfeeding, be unsatisfied with their infant feeding method,  
11 experience significant breastfeeding problem and report lower levels of  
12 breastfeeding self-efficacy (14).  
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28 Studies looking at sex ratio at birth have shown that there is a strong gender  
29 bias in India, favouring boys (15) (16) (17). Jayachandran et al have shown that  
30 boys tend to be breast fed longer (18). The EPDS in relation to sex of the child  
31 has not been studied. Also the inter-relationship between births of girl babies (in  
32 the society with a male sex bias), EPDS score soon after birth and exclusive  
33 breast feeding have not been examined previously. We hypothesize that there  
34 may be higher EPPD score and less exclusive early breast feeding of girl  
35 children. Recognition of these possible barriers to breast feeding may allow for  
36 more focussed support to mothers that will hopefully both promote breast  
37 feeding and improve survival of the girl baby.  
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50 **Ethics statement:** This study was approved by the St Stephen's Hospital  
51 Research Ethics Committee. Informed written consent was obtained from  
52 participants. The data and the names of the respondents are kept confidential.  
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60 The paper we propose to publish does not contain any identifying information, so

no response the patient made can be attributed to any of the participants in the study.

### **MATERIALS AND METHODS:**

This was an observational cohort study conducted between August 2010 and July 2011, at St. Stephens Hospital, Delhi. Only mothers delivering normally with their babies roomed-in were invited to participate. Mothers who consented to participate were interviewed on each of the first 2 days after delivery to enquire about breast feeding. The weight of the baby, sex of the child, mother's education, history of previous births and socio-economic status were recorded.

Mothers were administered Edinburgh Post Partum Depressions (EPPD) questionnaire on day 2(19). A Hindi translation of the EPPD was administered to mother who preferred Hindi (20). This translation has been back translated and validated previously (21).

Outcomes measured were exclusive breastfeeding in first 48 hours and postpartum depression on EPDS scale.

The socioeconomic status was assigned grades 1 to 5 taking in to account the skill levels and formal education using the 'Major Groups and Skill Levels Classification' of University of Warwick. ISCO-88 skill level 4 is considered grade 1 of socio-economic status, skill level 3 - grade 2, skill level 2 - grade 4, skill level 4 and those not working - grade 5 (22).

The education level was also graded as follows - grade 1: mothers who have not completed primary school education, grade 2: primary school graduates up to secondary school, grade 3: if they had passed up to higher secondary education,

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3 grade 4: college graduates and grade 5: mother who have completed a  
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5 postgraduates.  
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8 Correlates of exclusive breastfeeding were examined. The incidence of  
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10 exclusive breastfeeding in boys and girls was examined separately and also for  
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12 primi-parous mothers, separately from mothers who have had previous babies.  
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14 EPPDS in relation to sex of the child was also examined. Depression score above  
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16 11 on EPDS was considered as significant using cut-off determined previously by  
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18 Teissedre (13). Pearson chi square test was used to look for significance. Odds  
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20 ratio and 95% CI of exclusive breastfeeding were calculated. For proportions;  
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22 95% CI of the observed proportion is reported. Multiple regression analysis of  
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24 correlates of exclusive breastfeeding was also done. CI was calculated using CIA  
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26 software (23).  
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30 **Sample size calculation:** We calculated that in order to get results that reflect  
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32 the target population at the 95% confidence level with a margin of error of less  
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34 than 2.5%, we would need to interview 1537 mothers (24).  
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**RESULTS:**

During the study period 3,466 babies were born at the hospital. There were only 792 girls for every 1000 boys. Among women delivering their first babies, there were 901 girls per 1000 boys. Among mothers delivering their second babies the sex ratio was 737 girls to 1000 boys. If first child was a girl the ratio in the second delivery fell to 632:1000 but if the first child was a boy the sex ratio in second children was 841:1000.

1537 mothers of singleton babies were enrolled in the study. 1026 mothers were exclusively breastfeeding their babies. The sex ratio in the study sample 797 girls per 1000 boys was similar to the sex ratio of overall deliveries.

Babies with birth weight 2.5 kg or heavier were more likely to be breast fed compared to those less than 2.5 kg (low birth weight) (68.2% vs 59.8%,  $p < 0.01$ ). Multiparous mothers were more likely to be breast feeding than primiparous mothers (71.6% vs 62.8%, Difference = 0.089, 95% CI= 0.042 to 0.135).

Exclusive breast feeding was significantly more among mothers of boys as compared to those of girls (70.8 % vs 61.5 %  $p < 0.001$ ). Gender of baby had less influence on exclusive breastfeeding of first born children. 64.3% boy babies and 61.0% girl babies were exclusively breastfed ( $p = 0.32$ ). If the first born was a girl and second baby was also a girl, 60% of second children were breastfed compared to 77.3%, if the second child was a boy ( $p < 0.05$ ). The chances of breastfeeding the baby was highest if there was a boy sibling in the family; 78.9% compared to 67.9%, if there was no boy ( $p < 0.01$ ).

No significant difference in breastfeeding was found related to maternal age, socioeconomic status, maternal education, working status.

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6 The EPDS score was significantly higher in mothers giving birth to a girl child  
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8 (mean EPDS score  $6.0 \pm 3.39$  compared to  $5.4 \pm 2.87$ ,  $p < 0.01$ ). Significantly  
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10 more mothers of girl babies had a EPDS score higher than 11 compared to  
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12 mothers of boys (9.7% vs 5.4%, difference in proportion = -0.045, CI = -0.072 to  
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14 -0.019).

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17 Higher EPDS score affects breastfeeding rates. Only 52.4% mothers with score  
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19  $\geq 11$  were breast feeding compared to 67.8 % in those with score  $< 11$  ( $p <$   
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21 0.01). The depression score was significantly lower in mothers with at least one  
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23 male child when compared to those with no male child ( $5.21 \pm 3.25$  vs  $5.9 \pm 3.2$ ,  
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25  $p < 0.01$ ).

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28 To eliminate the influence of depression on breastfeeding subgroup analysis was  
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30 also done to look at incidence of breastfeeding against gender of the baby in  
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32 mothers with low EPDS. Even in the group with low EPDS score (namely in those  
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34 EPDS  $\leq 11$ ), 71.5% of male babies were exclusively breastfed compared to  
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36 63.0% of female babies, ( $p < 0.01$ ). This suggested that birth of a girl child  
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38 independently influences breastfeeding as well as resulting in increased EPDS  
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40 score which further reduces the chance of breastfeeding.

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43 The multiple logistic regression analysis indicated that birth of a female baby  
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45 (OR = 0.69, 95% CI: 0.56 to 0.87), high EPDS (OR = 0.53, 95% CI: 0.36 to  
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47 0.80) and low birth weight (OR = 0.72, 95% CI: 0.55 to 0.95) are associated  
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49 with lower odds of exclusive breastfeeding.  
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## **DISCUSSION:**

Low female to male sex ratio is used as an index of the sex bias in the community and can result from antenatal sex screening and selective abortion of female babies. In India, male: female sex ratio is 914:1000. Sex ratio at birth is a better index of antenatal sex selection than the overall sex ratio (20). Previous studies have shown that the sex ratio was particularly low in 2<sup>nd</sup> children if the first was a girl (17) (25).

The same phenomenon was seen again in the fresh cohort studied here. The sex ratio in 2<sup>nd</sup> order deliveries was 792 girls to 1000 boys but it was 632:1000 when 1<sup>st</sup> child was a girl child.

There was a male bias in breastfeeding too. More boys were being breastfed than girls (70.8% vs 61.5%,  $p < 0.001$ ). Jaychandran and Ilyana hypothesise that since breastfeeding inhibits post-natal fertility, a mother might limit the nursing of an infant if she wants to continue having children. Mothers of girl children may want a boy soon and so may limit the duration of her feeding (18). Kimani et al also found sex of the child to be one of the factors for suboptimal breastfeeding in Kenya ( $n = 4299$ ) (26).

### **Gender of baby and PPD**

Our study found that depression score done after 24 hours of birth was higher in mothers of girls (6.0 vs 5.4  $\pm$ ,  $p < 0.01$ ) and significantly more mothers of girl children had depression score  $> 11$  (9.7 vs 5.4). The influence of gender of baby on PPD in mothers has been reported before. Adewuya et al in a study on Nigerian women found female sex of the baby was one of the predictors for PPD (OR 2.74, CI 1.87-4.03) (27). Chandran et al in Tamilnadu showed that birth of

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3 a daughter, when a son was desired, was among the important risk factors for  
4 depression (28). In a study of women in Iran from two to 12 months after  
5 delivery, gender of the child was found to be one of the important factors  
6 contributing to PPD (29). The mothers with low EPDS score in our study done in  
7 the first 48 hours could be those with postpartum blues and not all of them will  
8 have persistent postpartum depression. Only follow up study will identify those  
9 with persistent postpartum depression. Our study protocol aimed to examine  
10 early breastfeeding did not examine the issue of long lasting depression in  
11 mothers of girl children.  
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### 23 **PPD and Breast feeding**

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26 We found that mothers with higher EPDS score were less likely to breastfeed  
27 (Only 52.4 % mothers with score  $\geq 11$  were breast feeding compared to 67.8 %  
28 in those with score  $< 11$ ) . The effects of PPD on breastfeeding have been  
29 reported earlier. Dennis also found that mothers with a EPDS  $> 12$  at 1 week  
30 postpartum were significantly more likely at 4 and/or 8 weeks to discontinue  
31 breastfeeding, be unsatisfied with their infant feeding method, experience  
32 significant breastfeeding problem and report lower levels of breastfeeding self-  
33 efficacy (31). In a cohort of 1745 Australian women it was found that median  
34 duration of breastfeeding was 26 weeks for women with early-onset depression,  
35 28 weeks for women with late-onset depression, and 39 weeks for women  
36 without depression (30). Dennis and McQueen found maternal depression to be  
37 associated with delayed initiation (31) and Ip and colleagues found its  
38 association with early discontinuation (8) of breast feeding.  
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55 The birth of the girl child is associated with greater depression, and the lower  
56 breastfeeding in girls could be mediated by the depression. To examine the  
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3 effect of depression on breastfeeding we studied breastfeeding in mothers of  
4 girls who had high EPDS score against those with low score. We found that in  
5 mothers of girls with higher depression score, only 47.7% were breastfed and in  
6 those with low score 63.0% were breastfed (Difference in proportion= 0.154,  
7 95% CI = -0.26 to -0.028). To see the influence of sex of the child on breast  
8 feeding independent of associated depression, we performed a sub group  
9 analysis by sex of child in mothers with (EPDS greater than 11 and EPDS less  
10 than 11). In mothers with low EPDS 71.5% mothers of boys were exclusively  
11 breastfeeding compared to 63.0% of girl babies ( $p < 0.01$ ). This suggests that  
12 sex of the child affects breastfeeding rates independently.  
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16 The results point to a pro male gender bias. Mothers of girls may need more  
17 help to overcome postpartum depression and for improving breastfeeding rates.  
18 This in turn would enhance the survival of girl children and improve the sex ratio  
19 in the country.  
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25 This study does suffer from some shortcomings in as much as it was done in an  
26 urban hospital catering mostly to a middle class clientele. The findings on sex  
27 ratio may therefore not be generalisable to the other social groups. Studies in  
28 other populations are needed to confirm our findings.  
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35 We studied the initiation of breastfeeding and exclusive breast feeding in the  
36 first 48 hours. More studies are needed to elaborate the effect of sex bias on the  
37 duration of breastfeeding.  
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44 We studied the EPDS in mothers within 48 hours of delivery. Many of those with  
45 high scores may be suffering from post partum blues rather than full fledged  
46 post partum depression. Our findings suggest that there are more mothers with  
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a higher score on the EPPD scale within 48 hours if they had a girl child. Further studies done later in the post natal period need to be done to examine how many of these mothers with high initial scores have longer lasting PPD.

TABLE 1:

| Characteristic                | EPDS<br>(Mean ± SD) | P       | Exclusive Breast Feeding |                   |         |                        |
|-------------------------------|---------------------|---------|--------------------------|-------------------|---------|------------------------|
|                               |                     |         | No<br>(N = 511)          | Yes<br>(N = 1026) | P       | Odds Ratio<br>(95% CI) |
| Maternal age (years)          |                     |         |                          |                   |         |                        |
| < 25                          | 5.8 ± 2.96          |         | 171 (33.5)               | 299 (29.1)        |         | 1.00                   |
| 25 – 29                       | 5.5 ± 3.17          |         | 237 (46.6)               | 474 (46.2)        |         | 1.14 (0.90 1.46)       |
| 30 – 34                       | 5.8 ± 3.35          |         | 84 (16.4)                | 210(20.5)         |         | 1.43 (1.04 1.96)       |
| ≥ 35                          | 5.3 ± 2.71          | 0.25    | 19 (3.7)                 | 43 (4.2)          | 0.16    | 1.20 (0.73 2.29)       |
| SES                           |                     |         |                          |                   |         |                        |
| Academic                      | 5.2 ± 3.12          |         | 79 (15.5)                | 165 (16.1)        |         | 1.00                   |
| Vocational                    | 5.2 ± 2.87          |         | 109 (21.4)               | 199 (19.4)        |         | 0.87 (0.61 1.25)       |
| Short education               | 5.5 ± 3.07          |         | 130 (25.5)               | 261 (25.5)        |         | 0.96 (0.68 1.35)       |
| Skilled                       | 6.2 ± 3.18          |         | 147 (28.8)               | 315 (30.8)        |         | 1.03 (0.74 1.43)       |
| Semi/Unskilled                | 5.8 ± 3.42          | < 0.001 | 45 (8.8)                 | 84 (8.2)          | 0.86    | 0.89 (0.57 1.40)       |
| Birth weight (Kg)             |                     |         |                          |                   |         |                        |
| ≥ 2.5                         | 5.5 ± 3.18          |         | 402 (78.8)               | 865 (84.3)        |         | 1.00                   |
| < 2.5                         | 6.1 ± 2.98          | < 0.01  | 108 (21.2)               | 161 (15.7)        | <0.01   | 0.69 (0.53 0.91)       |
| Maternal education            |                     |         |                          |                   |         |                        |
| < Primary                     | 6.8 ± 4.14          |         | 23 (4.5)                 | 34 (3.3)          |         | 1.00                   |
| Up to Secondary               | 6.0 ± 3.02          |         | 61 (11.9)                | 122 (11.9)        |         | 1.35 (0.73 2.49)       |
| Higher secondary              | 5.8 ± 2.93          |         | 111 (21.7)               | 201 (19.6)        |         | 1.22 (0.69 2.18)       |
| Graduate                      | 5.5 ± 3.03          |         | 226 (44.2)               | 499 (48.7)        |         | 1.49 (0.86 2.59)       |
| Post graduate                 | 5.3 ± 3.33          | < 0.01  | 90 (17.6)                | 169 (16.5)        | 0.44    | 1.27 (0.71 2.29)       |
| Working status                |                     |         |                          |                   |         |                        |
| Yes                           | 4.9 ± 3.07          |         | 87 (17.1)                | 212 (20.7)        |         | 1.00                   |
| No                            | 5.8 ± 3.11          | < 0.001 | 423 (82.9)               | 813 (79.3)        | 0.09    | 0.79 (0.60 1.04)       |
| EPDS                          |                     |         |                          |                   |         |                        |
| < 11                          | -                   | -       | 460 (90.0)               | 972 (94.7)        |         | 1.00                   |
| ≥ 11                          |                     |         | 51 (10.0)                | 54 (5.3)          | 0.001   | 0.50 (0.34 0.75)       |
| Sex of the newborn            |                     |         |                          |                   |         |                        |
| Male                          | 5.4 ± 2.87          |         | 249 (48.7)               | 606 (59.1)        |         | 1.00                   |
| Female                        | 6.0 ± 3.39          | < 0.001 | 262 (51.3)               | 420 (40.9)        | < 0.001 | 0.66 (0.34 0.75)       |
| Sex of the newborn –<br>Primi |                     |         |                          |                   |         |                        |

|             |            |      |            |            |        |                  |
|-------------|------------|------|------------|------------|--------|------------------|
| Male        | 5.7 ± 2.68 |      | 163 (81.4) | 294 (54.9) |        | 1.00             |
| Female      | 5.6 ± 3.27 | 0.87 | 154 (48.6) | 241 (45.1) | 0.32   | 0.87 (0.66 1.15) |
| No siblings |            |      | 317(62.0)  | 535(52.12) |        | 1.00             |
| MM          | 4.9 ± 3.49 |      | 17 (3.3.)  | 90 (8.8)   |        | 3.1 (1.83 5.36)  |
| MF          | 5.8 ± 3.4  |      | 17 (3.3)   | 54 (5.3)   |        | 1.9(1.07 1.30)   |
| FM          | 5.4 ± 3.59 |      | 24 (4.7)   | 82 (8.0)   |        | 2.0 (1.26 3.26)  |
| FF          | 6.6 ± 3.39 |      | 14 (2.7)   | 21 (2.0)   |        | 0.89 (0.45 1.77) |
| >2 children | 5.8 ± 3.14 | 0.06 | 122(23.9)  | 244 (23.8) | <0.001 | 1.2(0.92 1.53)   |

M = male, F = female, MM = 2<sup>nd</sup> male child, FF = 2<sup>nd</sup> female child, FM = male child after a female child

## **REFERENCE :**

1. American Academy of Paediatrics. Work Group on Breastfeeding. Breastfeeding and the Use of Human Milk. PEDIATRICS; 1997, Vol. 100 No. 6 pp. 1035-1039.
2. Huffman SL, Zehner ER, Victora C. Can improvements in breast-feeding practices reduce neonatal mortality in developing countries? Midwifery. 2001; 17:80-92.
3. Sheehan D, Bridle B, Hillier T, Feightner K, Hayward S, Lee KS, Krueger P, Sword W, James M. Breastfeeding outcomes of women following uncomplicated birth in Hamilton-Wentworth. *Can J Public Health* 1999; 90(6):408.
4. Anderson GC, Moore E, Hepworth J, Bergman N. Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database Syst Rev*. 2003;(2):CD003519
5. Unicef. Breastfeeding – The Remarkable First Hour Of Life. Malasia. Unicef 2007. [http://www.unicef.org/malaysia/Breastfeeding\\_First\\_Hour\\_of\\_Life.pdf](http://www.unicef.org/malaysia/Breastfeeding_First_Hour_of_Life.pdf) , Accessed on 27/6/12)

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2  
3 6 Unicef. Baby Friendly Hospital Initiative Revised, updated and expanded for  
4 integrated care. New York. World Health Organization and UNICEF 2009.

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6  
7 [http://www.unicef.org/nutrition/files/BFHI\\_2009\\_s4.pdf](http://www.unicef.org/nutrition/files/BFHI_2009_s4.pdf) (Accessed 27/6/12)

8  
9  
10  
11 7. McLearn KT, Minkovitz CS, Strobino DM, Marks E, Hou W. Maternal depressive  
12 symptoms at 2 to 4 months post partum and early parenting practices. Arch  
13  
14  
15 *Pediatr Adolesc Med.* 2006; 160:279-848.

16  
17  
18 8. Ip S, Chung M, Raman G, Chew P, Magula N, DeVine D, Trikalinos T, Lau  
19  
20  
21  
22 J. Breastfeeding and maternal and infant health outcomes in developed  
23  
24  
25 countries. *Evid Rep Technol Assess.* 2007 ;( 153):1-186.

26  
27 9. A-C Bernard-Bonin; Canadian Paediatric Society, Mental Health and  
28  
29  
30  
31  
32  
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57  
58  
59  
60  
Developmental Disabilities Committee *Paediatr Child Health* 2004;9(8):575-83

10. Melinda Smith, M.A., Jeanne Segal. Postpartum Depression and the Baby  
Blue; Symptoms, Treatment, and Support for New Moms.

[www.helpguide.org/mental/postpartum\\_depression.htm](http://www.helpguide.org/mental/postpartum_depression.htm). (Accessed on 10/3/13

)

11. U. Ottawa. Postpartum depression

[www.med.uottawa.ca/sim/data/Depression\\_postpartum\\_e.htm](http://www.med.uottawa.ca/sim/data/Depression_postpartum_e.htm) (Accessed  
on 3/10/13)

12. Murray D, Cox JL. Screening for depression during pregnancy with the  
Edinburgh Depression Scale (EPDS). *J Repro Infant Psychol* 1990: 8, 99-  
107



- 1  
2  
3 13. Teissèdre F, Chabrol H. Detecting women at risk for postnatal depression  
4 using the Edinburgh Postnatal Depression Scale at 2 to 3 days  
5 postpartum. *Can J Psychiatry*. 2004 Jan; 49(1):51-419.  
6  
7
- 8  
9 14. Dennis CL, McQueen K. Does maternal postpartum depressive  
10 symptomatology influence infant feeding outcomes? *Acta Paediatr*. 2007;  
11 96:590-4.  
12  
13
- 14 15. Nayar U. Doomed before Birth: Study of Declining Sex Ratio in the Age  
15 Group 0-6 Years in Selected Districts of Punjab and Haryana. New Delhi :  
16 NCERT; Department of Women's Studies. 1995. pp. 287  
17  
18
- 19 16. Sahni M, Verma N, Narula D, Varghese RM, Sreenivas V, Puliye JM.  
20 Missing girls in India: infanticide, feticide and made-to-order pregnancies?  
21 Insights from hospital-based sex-ratio-at-birth over the last century. *PLoS*  
22 *One*. 2008 21;3:e2224.  
23  
24
- 25 17. Manchanda S, Saikia B, Gupta N, Chowdhary S, Puliye JM. Sex ratio at  
26 birth in India, its relation to birth order, sex of previous children and use  
27 of indigenous medicine. *PLoS One*. 2011;6(6):e20097. Epub 2011 Jun 15.  
28  
29
- 30 18. Jayachandran S, Kuziemko I. Why do mothers breastfeed girls less than  
31 boys? Evidence and implications for child health in India. *Q J Econ*. 2011;  
32 126:1485-1538.  
33  
34
- 35 19. Hewitt C, Gilbody S, Brealey S, Paulden M, Palmer S, Mann R, Green J,  
36 Morrell J, Barkham M, Light K, Richards D. Methods to identify postnatal  
37 depression in primary care: an integrated evidence synthesis and value of  
38 information analysis. *Health Technol Assess*. 2009; 13:1-145, 147-230.  
39  
40
- 41 20. Dubey C, Gupta N, Bhasin S, Muthal RA, Arora R . Prevalence and  
42 associated risk factors for postpartum depression in women attending a  
43 tertiary hospital, Delhi, India. *Int J Soc Psychiatry*. 2011 Aug 5.  
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3 21. Nagpal J, Dhar RS, Sinha S, Bhargava V, Sachdeva A, Bhartia A. An  
4 exploratory study to evaluate the utility of an adapted Mother Generated  
5 Index (MGI) in assessment of postpartum quality of life in India. Health  
6 Qual Life Outcomes\_ 2008 Dec 2; 6:107.  
7  
8  
9  
10  
11 22. Warwick Institute For Employment Research. Major Groups and Skill Levels  
12 ISCO 88 Guide Section 2;  
13 <http://www2.warwick.ac.uk/fac/soc/ier/research/links/isco88/english/s2/>,  
14 (Accessed on 2/7/2012)  
15  
16  
17  
18  
19 23. Confidence Interval Analysis (CIA) Software. Available at  
20 [www.som.soton.ac.uk/cia](http://www.som.soton.ac.uk/cia) . (Accessed on 10/4/12)  
21  
22  
23  
24 24. Creative Research Systems. Sample size calculator. Available at  
25 <http://www.surveysystem.com/sscalc.htm#one>. (Accessed on 12/4/12)  
26  
27  
28  
29 25. Jha P, Kumar R, Vasa P, Dhingra N, Thiruchelvam D, Moineddin R. Low  
30 female[corrected]-to-male [corrected] sex ratio of children born in India:  
31 national survey of 1.1 million households. Lancet\_ 2006 21;367:211-8.  
32  
33  
34  
35 26. Kimani-Murage EW, Madise NJ, Fotso JC, Kyobutungi C, Mutua MK, Gitau  
36 TM, Yatich N. Patterns and determinants of breastfeeding and  
37 complementary feeding practices in urban informal settlements, Nairobi  
38 Kenya. BMC Public Health. 2011 26;11:396  
39  
40  
41  
42  
43 27. Adewuya AO, Fatoye FO, Ola BA, Ijaodola OR, Ibigbami  
44 SM. Sociodemographic and obstetric risk factors for postpartum depressive  
45 symptoms in Nigerian women. J Psychiatr Pract. 2005; 11:353-8.  
46  
47  
48  
49  
50 28. Chandran M, Thayan P, Muliylil J, Abraham S. Post-partum depression in a  
51 cohort of women from a rural area of Tamil Nadu, India. Incidence and  
52 risk factors. Br J Psychiatry. 2002; 181:499-504  
53  
54  
55  
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2  
3 29. Kheirabadi GR, Maracy MR, Barekatin M, Salehi M, Sadri GH, Kelishadi  
4 M, Cassy P. Risk factors of postpartum depression in rural areas of Isfahan  
5 Province, Iran. *Arch Iran Med.* 2009; 12:461-7.  
6  
7  
8  
9  
10 30. Henderson JJ, Evans SF, Straton JA, Priest SR, Hagan R. Impact of  
11 postnatal depression on breastfeeding duration. *Birth.* 2003  
12 Sep;30(3):175-80. Erratum in: *Birth.* 2004; 31:76.  
13  
14  
15 31. Dennis CL, McQueen K. The relationship between infant-feeding outcomes  
16 and postpartum depression: a qualitative systematic review. *Pediatrics.*  
17 2009; 123e736-51.  
18  
19  
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**Article focus:**

We hypothesise that in a society with a pro-male bias there would be:

1. Higher Postnatal Depression score in mothers of girl babies.
2. Less breastfeeding of girl children.

**Key Message:**

1. Sex bias was evident in the low sex ratio at birth and the significantly lower ratio in families where first child was a girl.
2. Postnatal depression score were higher after birth of a girl child.
3. There was less exclusive breastfeeding of girl children.
4. Mothers with high postnatal depression score were less likely to breastfeed

**Strength of study:**

1. The postpartum depression was evaluated using a widely validated EPDS scoring system.

**Limitations of study:**

1. It was done in an urban hospital catering mostly to a middle class clientele.

The findings on sex ratio may therefore not be generaliseable to the other social groups.

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3 2. We studied the initiation of breastfeeding and exclusive breast feeding in the  
4 first 48 hours. More studies are needed to elaborate the effect of sex bias on the  
5 duration of breastfeeding.  
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10 3. EPDS scoring was done in first 48 hrs and would include mothers with  
11 transient postpartum blues not amounting to postpartum depression. Follow up  
12 studies are needed to see that how many of them develop significant depression.  
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**ASSOCIATION OF BIRTH OF GIRLS, POSTPARTUM  
DEPRESSION AND EXCLUSIVE BREASTFEEDING – AN  
OBSERVATIONAL STUDY**

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| <b>Primary Subject Heading</b>: | Paediatrics  |
| Secondary Subject Heading:      | Global health  |
| Keywords:                       | Child protection < PAEDIATRICS, Community child health < PAEDIATRICS,<br>Depression & mood disorders < PSYCHIATRY  |
|                                 |  |



view only

***ASSOCIATION OF BIRTH OF GIRLS, POSTPARTUM DEPRESSION  
AND EXCLUSIVE BREASTFEEDING – AN OBSERVATIONAL STUDY***

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**Study was guided by Dr Jacob Puliyeel.**

**ABSTRACT**

OBJECTIVES AND HYPOTHESIS: To examine influence of gender of baby on exclusive breastfeeding and incidence of postpartum depression (PPD). We hypothesize that in a society with a male gender bias there may be more PPD and less exclusive breastfeeding of girls.

DESIGN: Prospective study

SETTING: The study was conducted in an urban, tertiary hospital in Delhi.

PARTICIPANTS: Mothers delivering normally with their babies roomed-in. 1537 eligible women participated in the study.

PRIMARY AND SECONDARY OUTCOME MEASURES: Exclusive breastfeeding within first 48 hours of life and score on Edinburgh post partum depression scale (EPDS) were recorded.

RESULTS: 3,466 babies were born in the hospital. There were 792 girls for every 1000 boys. Among primiparous women, sex-ratio was 901 girls per 1000 boys. In second babies the sex-ratio was 737:1000. If the first child was a girl the birth ratio fell to 632. 1026 mothers were exclusively breastfeeding. Exclusive breast feeding of boys was significantly higher (70.8% vs 61.5%  $p < 0.001$ ). The EPDS score was significantly higher with birth of girls (EPDS  $6.0 \pm 3.39$  vs  $5.4 \pm 2.87$   $p < 0.01$ ). Women with EPDS  $> 11$  were less likely to exclusively breast feed ( $p < 0.01$ ).

CONCLUSION: The results point to a pro male gender bias evidenced by a low sex ratio at birth, higher EPDS score in mothers of girls and less breastfeeding of female children.



### **Article Summary**

- The postpartum depression was evaluated using a widely validated EPDS scoring system.
- It was done in an urban hospital catering mostly to a middle class clientele. The findings on sex ratio may therefore not be generaliseable to the other social groups.
- We studied the initiation of exclusive breastfeeding in the first 48 hours. More studies are needed to elaborate the effect of sex bias on the duration of breastfeeding.
- EPDS scoring was done in first 48 hrs and would include mothers with transient postpartum blues not amounting to postpartum depression. Follow up studies are needed to see that how many of them develop significant depression.

## Reporting Checklist

| Section/Topic             | Item # | Recommendation  |
|---------------------------|--------|---|
| <b>Title and abstract</b> | 1      | (a) Indicate the study's design with a commonly used term in the title or the abstract  |
|                           |        | (b) Provide in the abstract an informative and balanced summary of what was done and what was found   |
| <b>Introduction</b>       |        |   |
| Background/rationale      | 2      | Explain the scientific background and rationale for the investigation being reported  |
| Objectives                | 3      | State specific objectives, including any pre-specified hypotheses   |
| <b>Methods</b>            |        |   |
| Study design              | 4      | Present key elements of study design early in the paper   |
| Setting                   | 5      | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection                                     |
| Participants              | 6      | (a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods for                              |
|                           |        | <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give                             |
|                           |        | <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants   |
|                           |        | (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed  |
|                           |        | <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case  |
| Variables                 | 7      | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable                            |
| Data sources/measurement  | 8*     | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparable methods if there is more than one group |
| Bias                      | 9      | Describe any efforts to address potential sources of bias   |
| Study size                | 10     | Explain how the study size was arrived at   |
| Quantitative variables    | 11     | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why  |
| Statistical methods       | 12     | (a) Describe all statistical methods, including those used to control for confounding   |
|                           |        | (b) Describe any methods used to examine subgroups and interactions   |
|                           |        | (c) Explain how missing data were addressed   |
|                           |        | (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed   |
|                           |        | <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed  |
|                           |        | <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy  |
|                           |        | (e) Describe any sensitivity analyses   |
| <b>Results</b>            |        |   |

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|--------------------------|-----|--|
| Participants             | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed in study, completing follow-up, and analysed                                 |
|                          |     | (b) Give reasons for non-participation at each stage   |
|                          |     | (c) Consider use of a flow diagram   |
| Descriptive data         | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders   |
|                          |     | (b) Indicate number of participants with missing data for each variable of interest  |
|                          |     | (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)   |
| Outcome data             | 15* | <i>Cohort study</i> —Report numbers of outcome events or summary measures over time  |
|                          |     | <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure   |
|                          |     | <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures   |
| Main results             | 16  | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence intervals). State whether confounders were adjusted for and why they were included |
|                          |     | (b) Report category boundaries when continuous variables were categorized  |
|                          |     | (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period   |
| Other analyses           | 17  | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses   |
| <b>Discussion</b>        |     |  |
| Key results              | 18  | Summarise key results with reference to study objectives   |
| Limitations              | 19  | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude where appropriate   |
| Interpretation           | 20  | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence                                 |
| Generalisability         | 21  | Discuss the generalisability (external validity) of the study results  |
| <b>Other information</b> |     |  |
| Funding                  | 22  | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present study is based  |

The above reporting checklist is included in the article

For peer review only

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**INTRODUCTION:**

Breast milk is the preferred food for all infants including premature and sick babies (1). UNICEF has promoted breastfeeding initiation within an hour of childbirth (2) (3). It provides nutritional, immunological, developmental and psychological advantages to the child besides health advantages to the mother and economic benefits to the family (1). It establishes skin-to-skin contact providing warmth to the newborn. Suckling at breast stimulates oxytocin release which further increasing flow of milk from breast. Breast milk reduces mortality in the first month of life (4). Early breast feed initiation is also associated with increased exclusive breastfeeding and longer duration of breastfeeding (5). The WHO and UNICEF launched the baby friendly hospital initiative in 1991 to strengthen maternity unit practices to support breastfeeding (6). However in spite of all these promotions and the known benefits of breastfeeding, exclusive breastfeeding and early initiation of breastfeeding are not often practiced. Factors intrinsic to the mother or baby may play a crucial role. One such factor is post partum depression (PPD) and there is evidence that mothers with PPD are less likely to breastfeed (7) (8).

Expression of postpartum depression may extend from the more transient baby blues to a longer lasting depression going on for several weeks (9). In both conditions there are mood swings, crying jags, sadness, insomnia and irritability. (10, 11)

The 10-question Edinburgh Postnatal Depression Scale (EPDS) is a validated, valuable and efficient way of identifying patients at risk for perinatal depression. It can be applied for depression screening during pregnancy. (12) The scale has been used as early as 1<sup>st</sup> or 2<sup>nd</sup> postpartum day in order to screen women at risk

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3 of PPD, by Teissedre F. In his study 1154 women completed EPDS at 2 to 3  
4 postpartum days and again at 4 to 6 weeks postpartum. He found that there was  
5 a highly significant positive correlation between EPDS scores on the two  
6 occasions (Spearman rank correlation:  $r = 0.59$ ,  $P < 0.0001$ ) (13). Although  
7 studies done in the immediate postpartum period are likely to pick up many  
8 cases of postpartum blues, Dennis found that mothers with a EPDS  $>12$  at 1  
9 week postpartum were significantly more likely at 4 and/or 8 weeks to  
10 discontinue breastfeeding, be unsatisfied with their infant feeding method,  
11 experience significant breastfeeding problem and report lower levels of  
12 breastfeeding self-efficacy (14).  
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28 Studies looking at sex ratio at birth have shown that there is a strong gender  
29 bias in India, favouring boys (15) (16) (17). Jayachandran et al have shown that  
30 boys tend to be breast fed longer (18). The EPDS score in relation to sex of the  
31 child has not been studied. Also the association between births of girl babies (in  
32 the society with a male sex bias), EPDS score soon after birth and exclusive  
33 breast feeding have not been examined previously. We hypothesize that there  
34 may be higher EPDS score and less exclusive early breast feeding of girl  
35 children. Recognition of these possible barriers to exclusive breast feeding may  
36 allow more focussed support to mothers that will promote breast feeding and  
37 improve survival of the girl baby.  
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50 **Ethics statement:** This study was approved by the St Stephen's Hospital  
51 Research Ethics Committee. Informed written consent was obtained from  
52 participants. The data and the names of the respondents are kept confidential.  
53 The paper we propose to publish does not contain any identifying information, so  
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3 no response the patient made can be attributed to any of the participants in the  
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5 study.  
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### 8 **MATERIALS AND METHODS:**

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10 This was an observational cross sectional study conducted between August  
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12 2010 and July 2011, at St. Stephens Hospital, Delhi. Only mothers delivering  
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14 normally with their babies roomed-in were invited to participate. Mothers who  
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16 consented to participate were interviewed on each of the first 2 days after  
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18 delivery to enquire about breast feeding. The weight of the baby, sex of the  
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20 child, mother's education, history of previous births and socio-economic status  
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22 were recorded.  
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26 Mothers were administered Edinburgh Post Partum Depression Scale (EPDS) on  
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28 day 2(19). A Hindi translation of the EPDS was administered to mother who  
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30 preferred Hindi (20). This translation has been back translated and validated  
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32 previously (21). The outcomes measured were exclusive breastfeeding in first 48  
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34 hours and postpartum depression on EPDS.  
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38 The socioeconomic status was assigned grades 1 to 5 taking in to account the  
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40 skill levels and formal education using the 'Major Groups and Skill Levels  
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42 Classification' of University of Warwick. ISCO-88 skill level 4 is considered grade  
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44 1 of socio-economic status, skill level 3 - grade 2, skill level 2 - grade 4, skill  
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46 level 4 and those not working - grade 5 (22).  
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50 The education level was also graded as follows - grade 1: mothers who have not  
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52 completed primary school education, grade 2: primary school graduates up to  
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54 secondary school, grade 3: if they had passed up to higher secondary education,  
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3 grade 4: college graduates and grade 5: mother who have completed a  
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5 postgraduate degree course.  
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8 Correlates of exclusive breastfeeding were examined. The incidence of  
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10 exclusive breastfeeding in boys and girls was examined separately and also for  
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12 primi-parous mothers, separately from mothers who have had previous babies.  
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14 EPDS score in relation to sex of the child was also examined. Depression score  
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16 above 11 on EPDS was considered as significant using cut-off determined  
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18 previously by Teissedre (13). Pearson chi square test was used to look for  
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20 significance. Odds ratio and 95% CI of exclusive breastfeeding were calculated.  
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22 For proportions; 95% CI of the observed proportion is reported. Multiple  
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24 regression analysis of correlates of exclusive breastfeeding was also done. CI  
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26 was calculated using CIA software (23).  
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30 **Sample size calculation:** We calculated that in order to get results that reflect  
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32 the target population at the 95% confidence level with a margin of error of less  
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34 than 2.5%, we would need to interview 1537 mothers (24).  
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**RESULTS:**

During the study period 3,466 babies were born at the hospital. There were only 792 girls for every 1000 boys. Among women delivering their first babies, there were 901 girls per 1000 boys. Among mothers delivering their second babies the sex ratio was 737 girls to 1000 boys. If first child was a girl the ratio in the second delivery fell to 632:1000 but if the first child was a boy the sex ratio in second children was 841:1000.

1537 mothers of singleton babies were enrolled in the study. The sex ratio in the study sample 797 girls per 1000 boys was similar to the sex ratio of overall deliveries. 1026 mothers in the study group were exclusively breastfeeding their babies.

Babies with birth weight 2.5 kg or heavier were more likely to be exclusively breast fed compared to those less than 2.5 kg (low birth weight) (68.2% vs 59.8%,  $p < 0.01$ ). Multiparous mothers were more likely to be exclusively breastfeeding than primiparous mothers (71.6% vs 62.8%, Difference = 0.089, 95% CI= 0.042 to 0.135).

Exclusive breast feeding was significantly more among mothers of boys as compared to those of girls (70.8 % vs 61.5 %  $p < 0.001$ ). Gender of baby had less influence on exclusive breastfeeding of first born children. 64.3% of primi boy babies and 61.0% of primi girl babies were exclusively breastfed ( $p = 0.32$ ).

If the first born was a girl and second baby was also a girl, 60% of second children were exclusively breastfed compared to 77.3%, if the second child was a boy ( $p = 0.05$ ). The chances of exclusively breastfeeding the baby was highest if there was a boy sibling in the family; 78.6% compared to 67.9%, if there was no boy ( $p < 0.01$ ).

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3 No significant difference in exclusive breastfeeding was found related to maternal  
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5 age, socioeconomic status, maternal education, working status.  
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10 The EPDS score was significantly higher in mothers giving birth to a girl child  
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12 (mean EPDS score  $6.0 \pm 3.39$  compared to  $5.4 \pm 2.87$ ,  $p < 0.01$ ). The  
13  
14 depression score was significantly lower in mothers with at least one male child  
15  
16 when compared to those with no male child ( $5.21 \pm 3.25$  vs  $5.9 \pm 3.2$ ,  $p < 0.01$ ).  
17  
18 Significantly more mothers of girl babies had an EPDS score higher than 11  
19  
20 compared to mothers of boys (9.7% vs 5.4%, difference in proportion = -0.045,  
21  
22 CI = -0.072 to -0.019).  
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25  
26 Higher EPDS score affects exclusive breastfeeding rates. Only 52.4% mothers  
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28 with score  $\geq 11$  were exclusively breastfeeding compared to 67.8 % in those with  
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30 score  $< 11$  ( $p < 0.01$ ).  
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36 Multiple logistic regression analysis indicated that birth of a female baby (OR =  
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38 0.69, 95% CI: 0.56 to 0.87), high EPDS (OR = 0.53, 95% CI: 0.36 to 0.80) and  
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40 low birth weight (OR = 0.72, 95% CI: 0.55 to 0.95) are associated with lower  
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42 odds of exclusive breastfeeding. This analysis suggests that sex of the baby,  
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44 EPDS score and birth weight are significant, independent factors influencing EBF.  
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**DISCUSSION:**

Low female to male sex ratio is used as an index of the sex bias in the community and can result from antenatal sex screening and selective abortion of female babies. In India, male: female sex ratio is 914:1000. Sex ratio at birth is a better index of antenatal sex selection than the overall sex ratio (20). Previous studies have shown that the sex ratio was particularly low in 2<sup>nd</sup> children if the first was a girl (17) (25).

The same phenomenon was seen again in the fresh cohort studied here. The sex ratio in 2<sup>nd</sup> order deliveries was 792 girls to 1000 boys but it was 632:1000 when 1<sup>st</sup> child was a girl child.

There was a male bias in breastfeeding too. More boys were being exclusively breastfed than girls. Jaychandran and Kuziemko hypothesise that since breastfeeding inhibits post-natal fertility, a mother might limit the nursing of an infant if she wants to continue having children. Mothers of girl children may want a boy soon and so may limit the duration of her feeding (18). Kimani et al also found sex of the child to be one of the factors for suboptimal breastfeeding in Kenya (n = 4299) (26).

**Gender of baby and PPD**

Our study found that depression score was higher in mothers of girls. The influence of gender of baby on postpartum depression in mothers has been reported before. Adewuya et al in a study on Nigerian women found female sex of the baby was one of the predictors for PPD (OR 2.74, CI 1.87-4.03) (27).

Chandran et al in Tamilnadu south India showed that birth of a daughter, when a son was desired, was an important risk factors for depression (28). In a study of

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3 women in Iran also gender of the child was found to be an important factor  
4 contributing to PPD (29). Mothers who conceive female fetus have higher level of  
5 beta hcg. This along with other similar hormonal changes may be a biological  
6 explanation for the child gender to affect PPD. (30) (31) However this has not  
7 been elucidated clearly as yet.  
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17 Our study of EPDS was done on the second day after delivery. The mothers with  
18 low EPDS score could be those with postpartum blues and not all of them will  
19 have persistent postpartum depression. Only follow up study will identify those  
20 with persistent postpartum depression. Our study protocol aimed at  
21 investigating early breastfeeding did not examine the issue of long lasting  
22 depression in mothers of girl children.  
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### 30 **PPD and Breast feeding**

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32 We found that mothers with higher EPDS score were less likely to be exclusively  
33 breastfeeding. The effects of PPD on exclusive breastfeeding have been reported  
34 earlier. Dennis also found that mothers with a EPDS >12 at 1 week postpartum  
35 were significantly more likely at 4 and/or 8 weeks to discontinue breastfeeding,  
36 be unsatisfied with their infant feeding method, experience significant  
37 breastfeeding problem and report lower levels of breastfeeding self-efficacy (32).  
38 In a cohort of 1745 Australian women it was found that median duration of  
39 breastfeeding was 26 weeks for women with early-onset depression, 28 weeks  
40 for women with late-onset depression, and 39 weeks for women without  
41 depression (33). Dennis and McQueen found maternal depression to be  
42 associated with delayed initiation (32) and Ip and colleagues found its  
43 association with early discontinuation (8) of breast feeding.  
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3 The birth of the girl child is associated with greater depression, and the lower  
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5 exclusive breastfeeding in girls could be mediated by the depression. To examine  
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7 the effect of depression on exclusive breastfeeding we studied exclusive  
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9 breastfeeding in mothers of girls who had high EPDS score against those with  
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11 low score. We found that in mothers of girls with higher depression score, only  
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13 47.7% were exclusively breastfeeding compared to 63.0% with low depression  
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15 levels (Difference in proportion= 0.154, 95% CI = -0.26 to -0.028). To look at  
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17 the influence of sex of the child on exclusive breastfeeding independent of  
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19 associated depression, we performed multiple logistic regression analysis which  
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21 showed that female sex of the child was independently associated with lower  
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23 odds of exclusive breastfeeding even after adjusting for depression. .  
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27 The results point to a pro male gender bias. Mothers of girls may need more  
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29 help to overcome postpartum depression and for improving breastfeeding rates.  
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31 This in turn could enhance the survival of girl children and improve the sex ratio  
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33 in the country.  
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37 This study does suffer from some shortcomings in as much as it was done in an  
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39 urban hospital catering mostly to a middle class clientele. The findings on sex  
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41 ratio may therefore not be generalisable to the other social groups. Studies in  
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43 other populations are needed to confirm our findings.  
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47 We studied exclusive breast feeding in the first 48 hours. More studies are  
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49 needed to elaborate the effect of sex bias on the duration of breastfeeding.  
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53 We studied the EPDS in mothers within 48 hours of delivery. Many of those with  
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55 high scores may be suffering from post partum blues rather than full fledged  
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57 post partum depression. Further studies done later in the post natal period need  
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to be done to examine how many of these mothers with high initial scores have longer lasting PPD.

Although multiple regression analysis shows that higher depression score and female sex of child is associated with lower odds of exclusive breastfeeding, a causal relationship is not implied.

**TABLE 1: Table showing correlates of Exclusive breast feeding and Postpartum depression**

| Characteristic       | EPDS<br>(Mean ± SD) | P       | Exclusive Breast Feeding |                   |        |                        |
|----------------------|---------------------|---------|--------------------------|-------------------|--------|------------------------|
|                      |                     |         | No<br>(N = 511)          | Yes<br>(N = 1026) | P      | Odds Ratio<br>(95% CI) |
| Maternal age (years) |                     |         |                          |                   |        |                        |
| < 25                 | 5.8 ± 2.96          |         | 171 (36.4)               | 299 (63.6)        |        | 1.00                   |
| 25 – 29              | 5.5 ± 3.17          |         | 237 (33.3)               | 474 (66.7)        |        | 1.14 (0.90 1.46)       |
| 30 – 34              | 5.8 ± 3.35          |         | 84 (28.6)                | 210 (71.4)        |        | 1.43 (1.04 1.96)       |
| ≥ 35                 | 5.3 ± 2.71          | 0.25    | 19 (30.6)                | 43 (69.4)         | 0.16   | 1.20 (0.73 2.29)       |
| SES                  |                     |         |                          |                   |        |                        |
| Academic             | 5.2 ± 3.12          |         | 79 (32.4)                | 165 (67.6)        |        | 1.00                   |
| Vocational           | 5.2 ± 2.87          |         | 109 (35.4)               | 199 (64.6)        |        | 0.87 (0.61 1.25)       |
| Short education      | 5.5 ± 3.07          |         | 130 (33.2)               | 261 (67.8)        |        | 0.96 (0.68 1.35)       |
| Skilled              | 6.2 ± 3.18          |         | 147 (31.8)               | 315 (68.2)        |        | 1.03 (0.74 1.43)       |
| Semi/Unskilled       | 5.8 ± 3.42          | < 0.001 | 45 (34.9)                | 84 (65.1)         | 0.86   | 0.89 (0.57 1.40)       |
| Birth weight (Kg)    |                     |         |                          |                   |        |                        |
| ≥ 2.5                | 5.5 ± 3.18          |         | 402 (31.7)               | 865 (68.3)        |        | 1.00                   |
| < 2.5                | 6.1 ± 2.98          | < 0.01  | 108 (40.1)               | 161 (59.9)        | < 0.01 | 0.69 (0.53 0.91)       |
| Maternal education   |                     |         |                          |                   |        |                        |
| < Primary            | 6.8 ± 4.14          |         | 23 (40.4)                | 34 (59.6)         |        | 1.00                   |
| Up to Secondary      | 6.0 ± 3.02          |         | 61 (33.3)                | 122 (66.7)        |        | 1.35 (0.73 2.49)       |
| Higher secondary     | 5.8 ± 2.93          |         | 111 (35.6)               | 201 (64.4)        |        | 1.22 (0.69 2.18)       |
| Graduate             | 5.5 ± 3.03          |         | 226 (31.2)               | 499 (68.8)        |        | 1.49 (0.86 2.59)       |
| Post graduate        | 5.3 ± 3.33          | < 0.01  | 90 (34.7)                | 169 (65.3)        | 0.44   | 1.27 (0.71 2.29)       |
| Working status       |                     |         |                          |                   |        |                        |

|                               |            |         |            |            |         |                  |
|-------------------------------|------------|---------|------------|------------|---------|------------------|
| Yes                           | 4.9 ± 3.07 |         | 87 (29.1)  | 212 (70.9) |         | 1.00             |
| No                            | 5.8 ± 3.11 | < 0.001 | 423 (34.2) | 813 (65.8) | 0.09    | 0.79 (0.60 1.04) |
| EPDS                          |            |         |            |            |         |                  |
| < 11                          | -          | -       | 460 (32.1) | 972 (67.9) |         | 1.00             |
| ≥ 11                          |            |         | 51 (48.6)  | 54 (51.4)  | 0.001   | 0.50 (0.34 0.75) |
| Sex of the newborn            |            |         |            |            |         |                  |
| Male                          | 5.4 ± 2.87 |         | 249 (29.1) | 606 (70.9) |         | 1.00             |
| Female                        | 6.0 ± 3.39 | < 0.001 | 262 (38.4) | 420 (61.6) | < 0.001 | 0.66 (0.34 0.75) |
| Sex of the newborn –<br>Primi |            |         |            |            |         |                  |
| Male                          | 5.7 ± 2.68 |         | 163 (35.7) | 294 (64.3) |         | 1.00             |
| Female                        | 5.6 ± 3.27 | 0.87    | 154 (39.0) | 241 (61.0) | 0.32    | 0.87 (0.66 1.15) |
| No siblings                   |            |         | 317(37.2)  | 535(62.7)  |         | 1.00             |
| MM                            | 4.9 ± 3.49 |         | 17 (15.9.) | 90 (84.1)  |         | 3.1 (1.83 5.36)  |
| MF                            | 5.8 ± 3.4  |         | 17 (23.9)  | 54 (76.1)  |         | 1.9(1.07 1.30)   |
| FM                            | 5.4 ± 3.59 |         | 24 (22.6)  | 82 (77.4)  |         | 2.0 (1.26 3.26)  |
| FF                            | 6.6 ± 3.39 |         | 14 (40.0)  | 21 (60.0)  |         | 0.89 (0.45 1.77) |
| >2 children                   | 5.8 ± 3.14 | 0.06    | 122(33.3)  | 244 (66.7) | <0.001  | 1.2(0.92 1.53)   |

M = male, F = female, MM = 2<sup>nd</sup> male child, FF = 2<sup>nd</sup> female child, FM = male child after a female child

**Table 2: Birth order 2 or more**

| Characteristic | EPDS (Mean ± SD) | P     | No EBF     | EBF        | P     | Odds Ratio (95% CI) |
|----------------|------------------|-------|------------|------------|-------|---------------------|
| Male sib       | 5.21±3.52        |       | 52 (26.8)  | 191 (38.9) |       | 1.00                |
| No Male sib    | 5.9±3.2          | <0.01 | 142 (73.2) | 300 (61.1) | <0.01 | 0.58 (0.40-0.83)    |

**Table 3: Breastfeeding by EPPDS and sex of child**

| Characteristic | EBF in males    | EBF in females  | P     |
|----------------|-----------------|-----------------|-------|
| EPDS <11       | 583/815 (71.5%) | 389/617 (63.0%) | 0.001 |
| EPDS ≥ 11      | 23/40 (57.5%)   | 31/65 (47.7%)   | 0.33  |

**Table 4: Multiple Logistic Regression Analysis**

| bf        | Odds Ratio | Std. Err. | z     | P> z  | [95% Conf. Interval] |          |
|-----------|------------|-----------|-------|-------|----------------------|----------|
| sex       | .6900392   | .0761006  | -3.36 | 0.001 | .5559035             | .8565409 |
| high_epds | .5326528   | .1094171  | -3.07 | 0.002 | .3561157             | .7967046 |
| low_bwt   | .719286    | .1005456  | -2.36 | 0.018 | .5469104             | .9459912 |

**Table 5: Edinburgh Postnatal Depression Scale**

| INSTRUCTIONS FOR USERS   |
|--|
| <ol style="list-style-type: none"> <li>1. The mother is asked to underline the response that comes closest to how she has been feeling in the previous 7 days.</li> <li>2. All 10 items must be completed.</li> <li>3. Care should be taken to avoid the possibility of the mother discussing her answers with others.</li> <li>4. The mother should complete the scale herself, unless she has limited English or has difficulty with reading.</li> <li>5. The Edinburgh Postnatal Depression Scale may be used at 6–8 weeks to screen postnatal women. The child health clinic, a postnatal checkup, or a home visit may provide a suitable opportunity for its completion.</li> </ol> |
| <p>Edinburgh Postnatal Depression Scale</p> <p>Name:</p> <p>Address:</p> <p>Baby's age:</p>  |
| <p>Because you have recently had a baby, we would like to know how you are feeling. Please underline the answer that comes closest to how you have felt in the past 7 days, not just how you feel today.</p>   |
| <p>Here is an example, already completed.</p> <p>I have felt happy:</p> <p>Yes, all the time</p> <p><u>Yes, most of the time</u></p> <p>No, not very often</p> <p>No, not at all</p>   |
| <p>This would mean: "I have felt happy most of the time" during the past week. Please complete the other questions in the same way.</p>  |



In the past 7 days:

1. I have been able to laugh and see the funny side of things  
As much as I always could  
Not quite so much now  
Definitely not so much now  
Not at all
2. I have looked forward with enjoyment to things  
As much as I ever did  
Rather less than I used to  
Definitely less than I used to  
Hardly at all
- \*3. I have blamed myself unnecessarily when things went wrong  
Yes, most of the time  
Yes, some of the time  
Not very often  
No, never
4. I have been anxious or worried for no good reason  
No, not at all  
Hardly ever  
Yes, sometimes  
Yes, very often
- \*5. I have felt scared or panicky for no very good reason  
Yes, quite a lot  
Yes, sometimes  
No, not much  
No, not at all
- \*6. Things have been getting on top of me  
Yes, most of the time I haven't been able to cope at all  
Yes, sometimes I haven't been coping as well as usual  
No, most of the time I have coped quite well  
No, I have been coping as well as ever
- \*7. I have been so unhappy that I have had difficulty sleeping  
Yes, most of the time  
Yes, sometimes

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- Not very often  
No, not at all
- \*8.** I have felt sad or miserable  
Yes, most of the time  
Yes, quite often  
Not very often  
No, not at all
- \*9.** I have been so unhappy that I have been crying  
Yes, most of the time  
Yes, quite often  
Only occasionally  
No, never
- \*10.** The thought of harming myself has occurred to me  
Yes, quite often  
Sometimes  
Hardly ever  
Never

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Response categories are scored 0, 1, 2, and 3 according to increased severity of the symptom. Items marked with an asterisk (\*) are reverse scored (i.e., 3, 2, 1, and 0). The total score is calculated by adding the scores for each of the 10 items.

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(34)(Permitted for general use)

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**Table 6: ISCO-88 major groups and skill level**

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| Major group                                   | ISCO skill levels |
|---|-------------------|
| 1. Legislators, senior officials and managers | -                 |
| 2. Professionals                              | 4th               |
| 3. Technicians and associate professionals    | 3rd               |

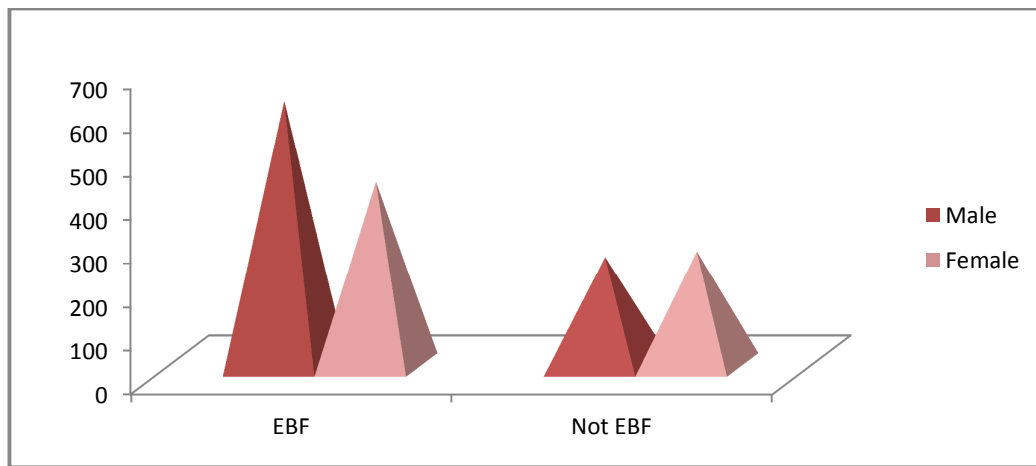
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| <u>4. Clerks</u>   | <u>2nd</u> |
| <u>5. Service workers and shop and market sales worker</u> | <u>2nd</u> |
| <u>6. Skill agricultural and fishery workers</u>           | <u>2nd</u> |
| <u>7. Craft and related workers</u>                        | <u>2nd</u> |
| <u>8. Plants and machine operators and assemblers</u>      | <u>2nd</u> |
| <u>9. Elementary occupations</u>                           | <u>1st</u> |
| <u>10. Armed forces</u>                                    | <u>-</u>   |

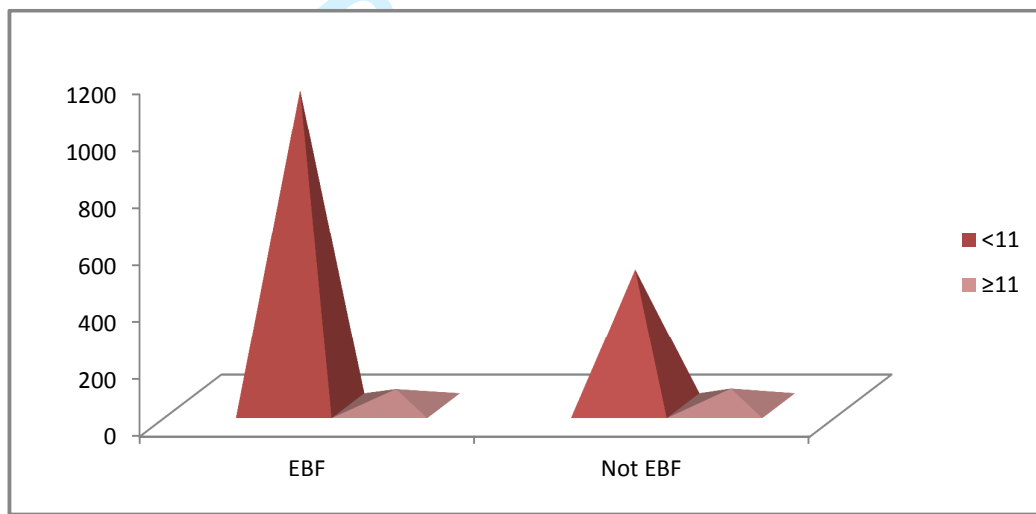
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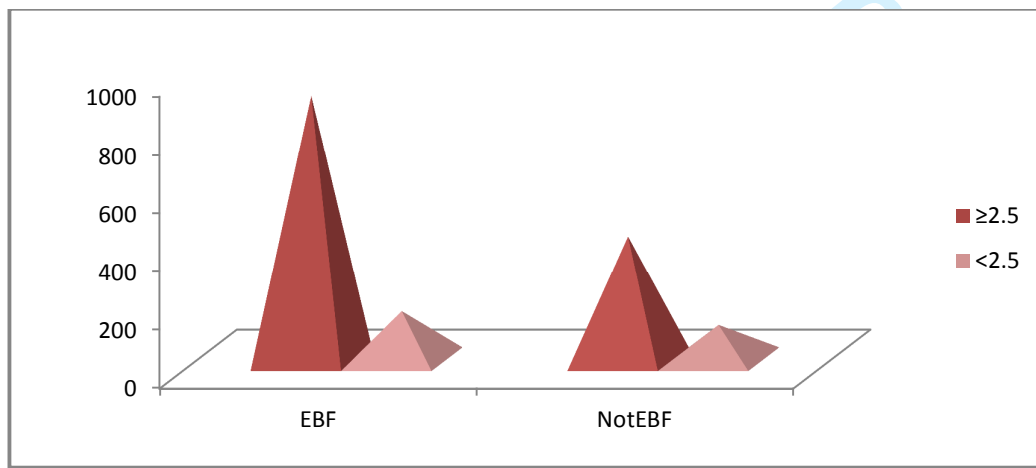
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**Fig 1: Breast feeding and sex of the child**



**Fig 2: Breast feeding and postpartum depression**



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### Fig 3: Breast feeding and birth weight

#### Article focus:

We hypothesise that in a society with a pro-male bias there would be:

1. Higher Postnatal Depression score in mothers of girl babies.
2. Less breastfeeding of girl children.

#### Key Message:

1. Sex bias was evident in the low sex ratio at birth and the significantly lower ratio in families where first child was a girl.
2. Postnatal depression score were higher after birth of a girl child.
3. There was less exclusive breastfeeding of girl children.
4. Mothers with high postnatal depression score were less likely to breastfeed

#### Strength of study:

1. The postpartum depression was evaluated using a widely validated EPDS scoring system.

#### Limitations of study:

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3 1. It was done in an urban hospital catering mostly to a middle class clientele.  
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5 The findings on sex ratio may therefore not be generalisable to the other social  
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7 groups.  
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11 2. We studied the initiation of exclusive breastfeeding in the first 48 hours. More  
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13 studies are needed to elaborate the effect of sex bias on the duration of  
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15 breastfeeding.  
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19 3. EPDS scoring was done in first 48 hrs and would include mothers with  
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21 transient postpartum blues not amounting to postpartum depression. Follow up  
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23 studies are needed to see that how many of them develop significant depression.  
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**REFERENCES:**

1. American Academy of Paediatrics. Work Group on Breastfeeding. Breastfeeding and the Use of Human Milk. *PEDIATRICS*; 1997, Vol. 100 No. 6 pp. 1035-1039.
2. Huffman SL, Zehner ER, Victora C. Can improvements in breast-feeding practices reduce neonatal mortality in developing countries? *Midwifery*. 2001; 17:80-92.
3. Sheehan D, Bridle B, Hillier T, Feightner K, Hayward S, Lee KS, Krueger P, Sword W, James M. Breastfeeding outcomes of women following uncomplicated birth in Hamilton-Wentworth. *Can J Public Health* 1999; 90(6):408.
4. Anderson GC, Moore E, Hepworth J, Bergman N. Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database Syst Rev*. 2003;(2):CD003519
5. Unicef. Breastfeeding – The Remarkable First Hour Of Life. Malasia. Unicef 2007. [http://www.unicef.org/malaysia/Breastfeeding\\_First\\_Hour\\_of\\_Life.pdf](http://www.unicef.org/malaysia/Breastfeeding_First_Hour_of_Life.pdf) , Accessed on 27/6/12)
6. Unicef. Baby Friendly Hospital Initiative Revised, updated and expanded for integrated care. New York. World Health Organization and UNICEF 2009. [http://www.unicef.org/nutrition/files/BFHI\\_2009\\_s4.pdf](http://www.unicef.org/nutrition/files/BFHI_2009_s4.pdf) (Accessed 27/6/12)
7. McLearn KT, Minkovitz CS, Strobino DM, Marks E, Hou W. Maternal depressive symptoms at 2 to 4 months post partum and early parenting practices. *Arch Pediatr Adolesc Med*. 2006; 160:279-848.

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59  
60
8. Ip S, Chung M, Raman G, Chew P, Magula N, DeVine D, Trikalinos T, Lau J. Breastfeeding and maternal and infant health outcomes in developed countries. *Evid Rep Technol Assess* . 2007 ;( 153):1-186.
  9. A-C Bernard-Bonnin; Canadian Paediatric Society, Mental Health and Developmental Disabilities Committee *Paediatr Child Health* 2004;9(8):575-83
  10. Melinda Smith, M.A., Jeanne Segal. Postpartum Depression and the Baby Blue; Symptoms, Treatment, and Support for New Moms. [www.helpguide.org/mental/postpartum\\_depression.htm](http://www.helpguide.org/mental/postpartum_depression.htm). (Accessed on 10/3/13)
  11. U. Ottawa. Postpartum depression [.www.med.uottawa.ca/sim/data/Depression\\_postpartum\\_e.htm](http://www.med.uottawa.ca/sim/data/Depression_postpartum_e.htm) (Accessed on 3/10/13)
  12. Murray D, Cox JL. Screening for depression during pregnancy with the Edinburgh Depression Scale (EPDS). *J Repro Infant Psychol* 1990: 8, 99-107
  13. Teissèdre F, Chabrol H. Detecting women at risk for postnatal depression using the Edinburgh Postnatal Depression Scale at 2 to 3 days postpartum. *Can J Psychiatry*. 2004 Jan; 49(1):51-419.
  14. Dennis CL, McQueen K. Does maternal postpartum depressive symptomatology influence infant feeding outcomes? *Acta Paediatr*. 2007; 96:590-4.
  15. Nayar U. Doomed before Birth: Study of Declining Sex Ratio in the Age Group 0-6 Years in Selected Districts of Punjab and Haryana. New Delhi : NCERT; Department of Women's Studies. 1995. pp. 287



- 1  
2  
3 16.Sahni M, Verma N, Narula D, Varghese RM, Sreenivas V, Puliye JM.  
4 Missing girls in India: infanticide, feticide and made-to-order  
5 pregnancies? Insights from hospital-based sex-ratio-at-birth over the last  
6 century. PLoS One. 2008 21;3:e2224.  
7  
8  
9  
10  
11 17. Manchanda S, Saikia B, Gupta N, Chowdhary S, Puliye JM. Sex ratio at  
12 birth in India, its relation to birth order, sex of previous children and use  
13 of indigenous medicine. PLoS One. 2011;6(6):e20097. Epub 2011 Jun 15.  
14  
15  
16 18.Jayachandran S, Kuziemko I. Why do mothers breastfeed girls less than  
17 boys? Evidence and implications for child health in India. Q J Econ. 2011;  
18 126:1485-1538.  
19  
20  
21 19. Hewitt C, Gilbody S, Brealey S, Paulden M, Palmer S, Mann R, Green J,  
22 Morrell J, Barkham M, Light K, Richards D. Methods to identify postnatal  
23 depression in primary care: an integrated evidence synthesis and value of  
24 information analysis. Health Technol Assess. 2009; 13:1-145, 147-230.  
25  
26  
27 20. Dubey C, Gupta N, Bhasin S, Muthal RA, Arora R . Prevalence and  
28 associated risk factors for postpartum depression in women attending a  
29 tertiary hospital, Delhi, India. Int J Soc Psychiatry. 2011 Aug 5.  
30  
31  
32 21. Nagpal J, Dhar RS, Sinha S, Bhargava V, Sachdeva A, Bhartia A. An  
33 exploratory study to evaluate the utility of an adapted Mother Generated  
34 Index (MGI) in assessment of postpartum quality of life in India. Health  
35 Qual Life Outcomes. 2008 Dec 2; 6:107.  
36  
37  
38 22. Warwick Institiue For Employment Research. Major Groups and Skill  
39 Levels ISCO 88 Guide Section 2;  
40 <http://www2.warwick.ac.uk/fac/soc/ier/research/links/isco88/english/s2/>,  
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3 23. Confidence Interval Analysis (CIA) Software. Available at  
4 [www.som.soton.ac.uk/cia](http://www.som.soton.ac.uk/cia) . (Accessed on 10/4/12)  
5  
6  
7 24. Creative Research Systems. Sample size calculator. Available at  
8 <http://www.surveysystem.com/sscalc.htm#one>.( Accessed on 12/4/12)  
9  
10  
11 25. Jha P, Kumar R, Vasa P, Dhingra N, Thiruchelvam D, Moineddin R. Low  
12 female[corrected]-to-male [corrected] sex ratio of children born in India:  
13 national survey of 1.1 million households. *Lancet*. 2006 21;367:211-8.  
14  
15  
16 26. Kimani-Murage EW, Madise NJ, Fotso JC, Kyobutungi C, Mutua MK, Gitau  
17 TM, Yatich N. Patterns and determinants of breastfeeding and  
18 complementary feeding practices in urban informal settlements, Nairobi  
19 Kenya. *BMC Public Health*. 2011 26;11:396  
20  
21  
22 27. Adewuya AO, Fatoye FO, Ola BA, Ijaodola OR, Ibigbami  
23 SM. Sociodemographic and obstetric risk factors for postpartum  
24 depressive symptoms in Nigerian women. *J Psychiatr Pract*. 2005;  
25 11:353-8.  
26  
27  
28 28. Chandran M, Thayan P, Muliyl J, Abraham S. Post-partum depression in  
29 a cohort of women from a rural area of Tamil Nadu, India. Incidence and  
30 risk factors. *Br J Psychiatry*. 2002; 181:499-504  
31  
32  
33 29. Kheirabadi GR, Maracy MR, Barekatin M, Salehi M, Sadri GH, Kelishadi  
34 M, Cassy P. Risk factors of postpartum depression in rural areas of  
35 Isfahan Province, Iran. *Arch Iran Med*. 2009; 12:461-7.  
36  
37  
38 30. Yaron Y, Lehavi O, Orr-Urtreger A, Gull I, Lessing JB, Amit A, Ben-  
39 Yosef D. Maternal serum HCG is higher in the presence of a female  
40 fetus as early as week 3 post-fertilization. *Hum Reprod*. 2002 Feb;  
41 17(2):485-9.  
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3 31.Hendrick V, Altshuler LL, Suri R. Hormonal changes in the postpartum  
4 and implications for postpartum depression. *Psychosomatics*. 1998 Mar-  
5 Apr; 39(2):93-101.  
6  
7  
8  
9 32.Dennis CL, McQueen K. The relationship between infant-feeding outcomes  
10 and postpartum depression: a qualitative systematic review.*Pediatrics*.  
11 2009; 123e736-51.  
12  
13  
14 33. Henderson JJ, Evans SF, Straton JA, Priest SR, Hagan R. Impact of  
15 postnatal depression on breastfeeding duration.*Birth*. 2003 Sep;  
16 30(3):175-80. Erratum in: *Birth*. 2004; 31:76.  
17  
18  
19  
20  
21 34.*Currie ML, Rademacher R: The pediatrician's role in recognizing and*  
22 *intervening in postpartum depression. Pediatr Clin North Am 2004;*  
23 *51:785-801.*  
24  
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GENDER BIAS AND POSTPARTUM DEPRESSION TOGETHER MILITATE AGAINST BREASTFEEDING OF  
 GIRLS: ~~ASSOCIATION OF NEWBORN GENDER BIRTH OF GIRLS, irth of~~  
**Girls POSTPARTUM DEPRESSION AND EXCLUSIVE**  
**BREASTFEEDING - AN OBSERVATIONAL STUDY** AN OBSERVATIONAL  
 COHORT STUDY

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**Study was guided by Dr Jacob Puliyel.**

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**ABSTRACT**

**OBJECTIVES AND HYPOTHESIS:** To examine influence of gender of baby on exclusive breastfeeding and incidence of postpartum depression (PPD) ~~and their interrelationship~~. We hypothesize that in a society with a male gender bias there may be more PPD and less exclusive breastfeeding of girls.

**DESIGN:** Prospective study

**SETTING:** The study was conducted in an urban, tertiary hospital in Delhi.

**PARTICIPANTS:** Mothers delivering normally with their babies roomed-in. 1537 eligible women participated in the study.

**PRIMARY AND SECONDARY OUTCOME MEASURES:** Exclusive Bbreast-feeding within first 48 hours of life and score on Edinburgh post partum depression scale (EPDS) were recorded ~~within first 48 hours of life~~.

**RESULTS:** 3,466 babies were born in the hospital. There were 792 girls for every 1000 boys. Among primiparous women, sex-ratio was 901 girls per 1000 boys. In second babies the sex-ratio was 737:1000. If the first child was a girl the birth ratio fell to 632. 1026 mothers were exclusively breastfeeding. Exclusive breast feeding of boys was significantly higher (70.8% vs 61.5% p<0.001). The EPDS score was significantly higher with birth of girls (EPDS 6.0±3.39 vs 5.4±2.87 p< 0.01). Women with EPDS <=11 were less likely to exclusively breast feed (p<0.01).

**CONCLUSION:** The results point to a pro male gender bias evidenced by a low sex ratio at birth, higher EPDS score in mothers of girls and less breastfeeding of female children.

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7 IMPLICATIONS Mothers of girls may need more help to overcome postpartum  
8 depression/ postpartum blues and for improving breastfeeding rates. This in turn  
9 would enhance the survival of girl children and improve the sex ratio in the  
10 country.

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15 AREAS FOR FURTHER RESEARCH: Studies in other populations are needed to  
16 confirm our findings. More studies are needed to elaborate the effect of sex bias  
17 on the duration of breastfeeding.

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19 Further studies done later in the post natal period to examine how many of  
20 these mothers with high initial scores have longer lasting PPD.  
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### **Article Summary**

- The postpartum depression was evaluated using a widely validated EPDS scoring system.
- It was done in an urban hospital catering mostly to a middle class clientele. The findings on sex ratio may therefore not be generalisable to the other social groups.
- We studied the initiation of exclusive breastfeeding in the first 48 hours. More studies are needed to elaborate the effect of sex bias on the duration of breastfeeding.
- EPDS scoring was done in first 48 hrs and would include mothers with transient postpartum blues not amounting to postpartum depression. Follow up studies are needed to see that how many of them develop significant depression.

**Reporting Checklist**

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| Section/Topic             | Item # | Recommendation   |
|---------------------------|--------|--|
| <b>Title and abstract</b> | 1      | (a) Indicate the study's design with a commonly used term in the title or the abstract<br>(b) Provide in the abstract an informative and balanced summary of what was done and what was found  |
| <b>Introduction</b>       |        |  |
| Background/rationale      | 2      | Explain the scientific background and rationale for the investigation being reported   |
| Objectives                | 3      | State specific objectives, including any pre-specified hypotheses  |
| <b>Methods</b>            |        |  |
| Study design              | 4      | Present key elements of study design early in the paper  |
| Setting                   | 5      | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection  |
| Participants              | 6      | (a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up<br><i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls<br><i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants<br>(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed<br><i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case |
| Variables                 | 7      | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable   |
| Data sources/measurement  | 8*     | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group   |
| Bias                      | 9      | Describe any efforts to address potential sources of bias  |
| Study size                | 10     | Explain how the study size was arrived at  |
| Quantitative variables    | 11     | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why   |
| Statistical methods       | 12     | (a) Describe all statistical methods, including those used to control for confounding<br>(b) Describe any methods used to examine subgroups and interactions<br>(c) Explain how missing data were addressed<br>(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed<br><i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed<br><i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy<br>(e) Describe any sensitivity analyses  |
| <b>Results</b>            |        |  |



|                          |              |   |
|--------------------------|--------------|---|
| Participants             | 13<br>*<br>- | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed<br><br>(b) Give reasons for non-participation at each stage<br><br>(c) Consider use of a flow diagram   |
| Descriptive data         | 14<br>*      | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders<br><br>(b) Indicate number of participants with missing data for each variable of interest<br><br>(c) Cohort study—Summarise follow-up time (eg, average and total amount)   |
| Outcome data             | 15<br>*<br>- | Cohort study—Report numbers of outcome events or summary measures over time<br><br>Case-control study—Report numbers in each exposure category, or summary measures of exposure<br><br>Cross-sectional study—Report numbers of outcome events or summary measures   |
| Main results             | 16           | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included<br><br>(b) Report category boundaries when continuous variables were categorized<br><br>(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period |
| Other analyses           | 17           | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses  |
| <b>Discussion</b>        |              |   |
| Key results              | 18           | Summarise key results with reference to study objectives  |
| Limitations              | 19           | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias  |
| Interpretation           | 20           | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence  |
| Generalisability         | 21           | Discuss the generalisability (external validity) of the study results   |
| <b>Other information</b> |              |   |
| Funding                  | 22           | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based   |

The above reporting checklist is included in the article

For peer review only

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## **INTRODUCTION:**

Breast milk is the preferred food for all infants including premature and sick babies (1). UNICEF has promoted breastfeeding initiation within an hour of childbirth (2) (3). It provides nutritional, immunological, developmental, and psychological advantages to the child besides health advantages to the mother and economic benefits to the family (1). It establishes skin-to-skin contact providing warmth to the newborn. Suckling at breast stimulates oxytocin release which further increasing flow of milk from breast. Breast milk reduces mortality in the first month of life (4). Early breast feed initiation is also associated with increased exclusive breastfeeding and longer duration of breastfeeding in following months (5). The WHO and UNICEF launched the baby friendly hospital initiative in 1991 to strengthen maternity unit practices to support breastfeeding (6). However in spite of all these promotions and the known benefits of breastfeeding, exclusive breastfeeding and early initiation of breastfeeding are not often practiced. Factors intrinsic to the mother or baby may play a crucial role. One such factor is post partum depression (PPD) and there is evidence that mothers with PPD are less likely to breastfeed (7) (8).

▲ Expression of postpartum depression may extend from the more transient baby blues to a longer lasting depression going on for several weeks (9). In both conditions there are mood swings, crying jags, sadness, insomnia and irritability. (10, 11)

▲ The 10-question Edinburgh Postnatal Depression Scale (EPDS) is a validated, valuable and efficient way of identifying patients at risk for perinatal depression. It can be applied for depression screening during pregnancy. (12) The scale has been used as early as 1<sup>st</sup> or 2<sup>nd</sup> postpartum day in order to screen women at risk

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7 of PPD, by Teissedre F. In his study 1154 women completed EPDS at 2 to 3  
8 postpartum days and again at 4 to 6 weeks postpartum. He found that there was  
9 a highly significant positive correlation between EPDS scores on the two  
10 occasions (Spearman rank correlation:  $r = 0.59$ ,  $P < 0.0001$ ) (13). Although ~~the~~  
11 studies done in the immediate postpartum period are likely to pick up many  
12 cases of postpartum blues, Dennis found that mothers with a EPDS  $>12$  at 1  
13 week postpartum were significantly more likely at 4 and/or 8 weeks to  
14 discontinue breastfeeding, be unsatisfied with their infant feeding method,  
15 experience significant breastfeeding problem and report lower levels of  
16 breastfeeding self-efficacy (14).  
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29 Studies looking at sex ratio at birth have shown that there is a strong gender  
30 bias in India, favouring boys (15) (16) (17). Jayachandran et al have shown that  
31 boys tend to be breast fed longer (18). The EPDS score in relation to sex of the  
32 child has not been studied. Also the association inter-relationship between births  
33 of girl babies (in the society with a male sex bias), EPDS score soon after birth  
34 and exclusive breast feeding have not been examined previously. We  
35 hypothesize that there may be higher EPDSPD score and less exclusive early  
36 breast feeding of girl children. Recognition of these possible barriers to exclusive  
37 breast feeding may allow ~~for~~ more focussed support to mothers that will  
38 hopefully both promote breast feeding and improve survival of the girl baby.  
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48 **Ethics statement:** This study was approved by the St Stephen's Hospital  
49 Research Ethics Committee. Informed written consent was obtained from  
50 participants. The data and the names of the respondents are kept confidential.  
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52 The paper we propose to publish does not contain any identifying information, so  
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no response the patient made can be attributed to any of the participants in the study.

### **MATERIALS AND METHODS:**

This was an observational ~~cross sectional cohort~~ study conducted between August 2010 and July 2011, at St. Stephens Hospital, Delhi. Only mothers delivering normally with their babies roomed-in were invited to participate. Mothers who consented to participate were interviewed on each of the first 2 days after delivery to enquire about breast feeding. The weight of the baby, sex of the child, mother's education, history of previous births and socio-economic status were recorded.

**~~Mothers were administered~~**  
**Edinburgh Post Partum**  
**Depressions Scale (EPPDS)**  
**~~questionnaire~~ on day 2(19). A**  
**Hindi translation of the EPPDS**  
**was administered to mother who**  
**preferred Hindi (20). This**

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# translation has been back translated and validated previously (21).

The Outcomes measured were exclusive breastfeeding in first 48 hours and postpartum depression on ~~EPDS~~-EPDSscale.

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The socioeconomic status was assigned grades 1 to 5 taking in to account the skill levels and formal education using the 'Major Groups and Skill Levels Classification' of University of Warwick. ISCO-88 skill level 4 is considered grade 1 of socio-economic status, skill level 3 - grade 2, skill level 2 - grade 4, skill level 4 and those not working - grade 5 (22).

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The education level was also graded as follows - grade 1: mothers who have not completed primary school education, grade 2: primary school graduates up to secondary school, grade 3: if they had passed up to higher secondary education, grade 4: college graduates and grade 5: mother who have completed a postgraduates degree course.

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Correlates of exclusive breastfeeding were examined. The incidence of exclusive breastfeeding in boys and girls was examined separately and also for primi-parous mothers, separately from mothers who have had previous babies.

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EPDS score in relation to sex of the child was also examined. Depression score above 11 on EPDS was considered as significant using cut-off determined previously by Teissedre (13). Pearson chi square test was used to look for significance. Odds ratio and 95% CI of exclusive breastfeeding were calculated.

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7 For proportions; 95% CI of the observed proportion is reported. Multiple  
8 regression analysis of correlates of exclusive breastfeeding was also done. CI  
9 was calculated using CIA software (23).

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13 **Sample size calculation:** We calculated that in order to get results that reflect  
14 the target population at the 95% confidence level with a margin of error of less  
15 than 2.5%, we would need to interview 1537 mothers (24).  
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37 **RESULTS:**

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38 During the study period 3,466 babies were born at the hospital. There were only  
39 792 girls for every 1000 boys. Among women delivering their first babies, there  
40 were 901 girls per 1000 boys. Among mothers delivering their second babies the  
41 sex ratio was 737 girls to 1000 boys. If first child was a girl the ratio in the  
42 second delivery fell to 632:1000 but if the first child was a boy the sex ratio in  
43 second children was 841:1000.  
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52 1537 mothers of singleton babies were enrolled in the study. 1026 mothers were  
53 exclusively breastfeeding their babies. The sex ratio in the study sample 797  
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7 girls per 1000 boys was similar to the sex ratio of overall deliveries. [1026](#)

8 [mothers in the study group were exclusively breastfeeding their babies.](#)

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10 Babies with birth weight 2.5 kg or heavier were more likely to be **exclusively**  
11 breast fed compared to those less than 2.5 kg (low birth weight) (68.2% vs

12 59.8%,  $p < 0.01$ ). Multiparous mothers were more likely to be **exclusively** breast  
13 feeding than primiparous mothers (71.6% vs 62.8%, Difference = 0.089, 95%  
14 CI= 0.042 to 0.135).

15  
16 **Exclusive breast feeding was significantly more among mothers of boys as**

17 compared to those of girls (70.8 % vs 61.5 %  $p < 0.001$ ). Gender of baby had  
18 less influence on exclusive breastfeeding of first born children. 64.3% **of primi**  
19 boy babies and 61.0% **of primi** girl babies were exclusively breastfed ( $p = 0.32$ ).

20  
21 If the first born was a girl and second baby was also a girl, 60% of second  
22 children were **exclusively** breastfed compared to 77.3%, if the second child was  
23 a boy ( $p \leq 0.05$ ). The chances of **exclusively** breastfeeding the baby was highest  
24 if there was a boy sibling in the family; 78.69% compared to 67.9%, if there  
25 was no boy ( $p < 0.01$ ).

26  
27 **No significant difference in exclusive breastfeeding was found related to maternal**  
28 age, socioeconomic status, maternal education, working status.

29  
30 **The EPDS score was significantly higher in mothers giving birth to a girl child**

31 (mean EPDS score  $6.0 \pm 3.39$  compared to  $5.4 \pm 2.87$ ,  $p < 0.01$ ). [The](#)

32 [depression score was significantly lower in mothers with at least one male child](#)

33 [when compared to those with no male child \( \$5.21 \pm 3.25\$  vs  \$5.9 \pm 3.2\$ ,  \$p < 0.01\$ \).](#)

34  
35 Significantly more mothers of girl babies had **aan** EPDS score higher than 11

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compared to mothers of boys (9.7% vs 5.4%, difference in proportion=-0.045, CI= -0.072 to -0.019).

Higher EPDS score affects exclusive breastfeeding rates. Only 52.4% mothers with score  $\geq 11$  were exclusively breast-feeding compared to 67.8 % in those with score  $< 11$  ( $p < 0.01$ ). ~~The depression score was significantly lower in mothers with at least one male child when compared to those with no male child (5.21 $\pm$ 3.25 vs 5.9  $\pm$  3.2,  $p < 0.01$ ).~~

~~To eliminate the influence of depression on breastfeeding subgroup analysis was also done to look at incidence of breastfeeding against gender of the baby in mothers with low EPDS. Even in the group with low EPDS score (namely in those EPDS  $\leq 11$ ), 71.5% of male babies were exclusively breastfed compared to 63.0% of female babies, ( $p < 0.01$ ). This suggested that birth of a girl child independently influences breastfeeding as well as resulting in increased EPDS score which further reduces the chance of breastfeeding.~~

The ~~m~~Multiple logistic regression analysis indicated that birth of a female baby (OR = 0.69, 95% CI: 0.56 to 0.87), high EPDS (OR = 0.53, 95% CI: 0.36 to 0.80) and low birth weight (OR = 0.72, 95% CI: 0.55 to 0.95) are associated with lower odds of exclusive breastfeeding. This analysis suggests that sex of the baby, EPDS score and birth weight are significant, independent factors influencing EBF.

## **DISCUSSION:**

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7 ~~Low female to male sex ratio is used as an index of the sex bias in the~~  
8 community and can result from antenatal sex screening and selective abortion of  
9 female babies. In India, male: female sex ratio is 914:1000. Sex ratio at birth is  
10 a better index of antenatal sex selection than the overall sex ratio (20). Previous  
11 studies have shown that the sex ratio was particularly low in 2<sup>nd</sup> children if the  
12 first was a girl (17) (25).  
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19 ~~The same phenomenon was seen again in the fresh cohort studied here. The sex~~  
20 ratio in 2<sup>nd</sup> order deliveries was 792 girls to 1000 boys but it was 632:1000  
21 when 1<sup>st</sup> child was a girl child.  
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25 ~~There was a male bias in breastfeeding too. More boys were being~~ exclusively  
26 ~~breastfed than girls (70.8% vs 61.5%, p < 0.001). Jaychandran and Hyana~~  
27 ~~Kuziemko hypothesise that since breastfeeding inhibits post-natal fertility, a~~  
28 mother might limit the nursing of an infant if she wants to continue having  
29 children. Mothers of girl children may want a boy soon and so may limit the  
30 duration of her feeding (18). Kimani et al also found sex of the child to be one of  
31 the factors for suboptimal breastfeeding in Kenya (n = 4299) (26).  
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### 39 Gender of baby and PPD

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42 ~~Our study found that depression score~~ done after 24 hours of birth ~~was higher in~~  
43 ~~mothers of girls (6.0 vs 5.4 ±, p < 0.01) and significantly more mothers of girl~~  
44 ~~children had depression score > 11 (9.7 vs 5.4). The influence of gender of baby~~  
45 ~~on postpartum depression-PPD in mothers has been reported before. Adewuya et~~  
46 al in a study on Nigerian women found female sex of the baby was one of the  
47 predictors for PPD: (OR 2.74, CI 1.87-4.03) (27). Chandran et al in Tamilnadu  
48 south India showed that birth of a daughter, when a son was desired, was  
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7 among the important risk factors for depression (28). In a study of women in  
8 Iran ~~also from two to 12 months after delivery~~, gender of the child was found to  
9 be ~~an one of the~~ important factors contributing to PPD (29). ~~Mothers and this~~  
10 ~~may be a biological explanation for the phenomenon. However this has not been~~  
11 ~~elucidated clearly as yet. Mothers who conceive female fetus have higher level of~~  
12 ~~beta hcg. This along with other similar hormonal changes may be a biological~~  
13 ~~explanation for the child gender to affect PPD. (30) (31) However this has not~~  
14 ~~been elucidated clearly as yet.~~

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25 ~~Our~~ study of EPDS was done on the second day after delivery. The mothers  
26 with low EPDS score ~~in our study done in the first 48 hours~~ could be those with  
27 postpartum blues and not all of them will have persistent postpartum  
28 depression. Only follow up study will identify those with persistent postpartum  
29 depression. Our study protocol aimed ~~at to examine investigating~~ early  
30 breastfeeding did not examine the issue of long lasting depression in mothers of  
31 girl children.

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### 32 **PPD and Breast feeding**

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41 We found that mothers with ~~higher EPDS~~ higher EPDS score were less likely to  
42 ~~be exclusively~~ breastfeeding (Only 52.4 % mothers with score  $\geq 11$  were breast  
43 ~~feeding compared to 67.8 % in those with score  $< 11$ ). The effects of PPD on~~  
44 ~~exclusive~~ breastfeeding have been reported earlier. Dennis also found that  
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48 mothers with a EPDS  $> 12$  at 1 week postpartum were significantly more likely at  
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7 women it was found that median duration of breastfeeding was 26 weeks for  
8 women with early-onset depression, 28 weeks for women with late-onset  
9 depression, and 39 weeks for women without depression (~~3033~~). Dennis and  
10 McQueen found maternal depression to be associated with delayed initiation  
11 (~~3132~~) and Ip and colleagues ~~—~~found its association with early discontinuation  
12 (8) of breast feeding.

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18 ~~The birth of the girl child is associated with greater depression, and the lower~~  
19 ~~exclusive~~ breastfeeding in girls could be mediated by the depression. To examine  
20 the effect of depression on ~~exclusive~~ breastfeeding we studied ~~exclusive~~  
21 breastfeeding in mothers of girls who had high EPDS score against those with  
22 low score. We found that in mothers of girls with higher depression score, only  
23 47.7% were ~~exclusively -breastfeeding compared to and in those with low score~~  
24 63.0% ~~with low depression levels were breastfed~~ (Difference in proportion=  
25 0.154, 95% CI = -0.26 to -0.028). To ~~look at see~~ the influence of sex of the child  
26 on ~~exclusive~~ breast-feeding independent of associated depression, we performed  
27 ~~multiple logistic regression analysis which showed that female sex of the child~~  
28 ~~was independently associated with lower odds of exclusive breastfeeding even~~  
29 ~~after adjusting for depression. a sub group analysis by sex of child in mothers~~  
30 ~~with (EPDS greater than 11 and EPDS less than 11). -In mothers with low EPDS~~  
31 ~~71.5% mothers of boys were exclusively breastfeeding compared to 63.0% of~~  
32 ~~girl babies (p < 0.01). This suggests that sex of the child affects breastfeeding~~  
33 ~~rates independently.~~

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49 ~~The results point to a pro male gender bias. Mothers of girls may need more~~  
50 help to overcome postpartum depression and for improving breastfeeding rates.  
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7 This in turn ~~could would~~ enhance the survival of girl children and improve the  
8 sex ratio in the country.  
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11 ~~▲ This study does suffer from some shortcomings in as much as it was done in an~~  
12 urban hospital catering mostly to a middle class clientele. The findings on sex  
13 ratio may therefore not be generalisable to the other social groups. Studies in  
14 other populations are needed to confirm our findings.  
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20 ~~▲ We studied the initiation of breastfeeding and~~ exclusive breast feeding in the  
21 first 48 hours. More studies are needed to elaborate the effect of sex bias on the  
22 duration of breastfeeding.  
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26 ~~▲ We studied the EPDS in mothers within 48 hours of delivery. Many of those with~~  
27 high scores may be suffering from post partum blues rather than full fledged  
28 post partum depression. ~~Our findings suggest that there are more mothers with~~  
29 ~~a higher score on the EPPD scale within 48 hours if they had a girl child.~~ Further  
30 studies done later in the post natal period need to be done to examine how  
31 many of these mothers with high initial scores have longer lasting PPD.  
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38 ~~Although multiple regression analysis shows that higher depression score and~~  
39 ~~female sex of child is associated with lower odds of exclusive breastfeeding, a~~  
40 ~~causal relationship is not implied.~~  
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**TABLE 1: Table showing correlates of Exclusive breast feeding and Postpartum depression**

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| Characteristic       | EPDS (Mean ± SD) | P       | Exclusive Breast Feeding   |                             |            |                     |
|----------------------|------------------|---------|----------------------------|-----------------------------|------------|---------------------|
|                      |                  |         | No (N = 511)               | Yes (N = 1026)              | P          | Odds Ratio (95% CI) |
| Maternal age (years) |                  |         |                            |                             |            |                     |
| < 25                 | 5.8 ± 2.96       | 0.25    | 171                        | 299 ( <del>29.163.6</del> ) | 0.16       | 1.00                |
| 25 – 29              | 5.5 ± 3.17       |         | ( <del>33.536.4</del> )    | 474 ( <del>46.266.7</del> ) |            | 1.14 (0.90          |
| 30 – 34              | 5.8 ± 3.35       |         | 237                        | 210( <del>20.571.4</del> )  |            | 1.46)               |
| ≥ 35                 | 5.3 ± 2.71       |         | ( <del>46.633.3</del> )    | 43 ( <del>4.269.4</del> )   |            | 1.43 (1.04          |
|                      |                  |         | 84 ( <del>16.428.6</del> ) |                             |            | 1.96)               |
|                      |                  |         | 19 ( <del>3.730.6</del> )  |                             | 1.20 (0.73 |                     |
|                      |                  |         |                            |                             | 2.29)      |                     |
| SES                  |                  |         |                            |                             |            |                     |
| Academic             | 5.2 ± 3.12       | < 0.001 | 79 ( <del>15.532.4</del> ) | 165 ( <del>16.167.6</del> ) | 0.86       | 1.00                |
| Vocational           | 5.2 ± 2.87       |         | 109                        | 199 ( <del>19.464.6</del> ) |            | 0.87 (0.61          |
| Short education      | 5.5 ± 3.07       |         | ( <del>21.435.4</del> )    | 261 ( <del>25.567.8</del> ) |            | 1.25)               |
| Skilled              | 6.2 ± 3.18       |         | 130                        | 315 ( <del>30.868.2</del> ) |            | 0.96 (0.68          |
| Semi/Unskilled       | 5.8 ± 3.42       |         | ( <del>25.533.2</del> )    | 84 ( <del>8.265.1</del> )   |            | 1.35)               |
|                      |                  |         | 147                        |                             | 1.03 (0.74 |                     |
|                      |                  |         | ( <del>28.831.8</del> )    |                             | 1.43)      |                     |
|                      |                  |         | 45 ( <del>8.834.9</del> )  |                             | 0.89 (0.57 |                     |
|                      |                  |         |                            |                             | 1.40)      |                     |
| Birth weight (Kg)    |                  |         |                            |                             |            |                     |
| ≥ 2.5                | 5.5 ± 3.18       | < 0.01  | 402                        | 865 ( <del>84.368.3</del> ) | <0.01      | 1.00                |
| < 2.5                | 6.1 ± 2.98       |         | ( <del>78.831.7</del> )    | 161 ( <del>15.759.9</del> ) |            | 0.69 (0.53          |
|                      |                  |         | 108                        |                             |            | 0.91)               |
|                      |                  |         | ( <del>21.240.1</del> )    |                             |            |                     |
| Maternal education   |                  |         |                            |                             |            |                     |
| < Primary            | 6.8 ± 4.14       | < 0.01  | 23 ( <del>4.540.4</del> )  | 34 ( <del>3.359.6</del> )   | 0.44       | 1.00                |
| Up to Secondary      | 6.0 ± 3.02       |         | 61 ( <del>11.933.3</del> ) | 122 ( <del>11.966.7</del> ) |            | 1.35 (0.73          |
| Higher secondary     | 5.8 ± 2.93       |         | 111                        | 201 ( <del>19.664.4</del> ) |            | 2.49)               |
| Graduate             | 5.5 ± 3.03       |         | ( <del>21.735.6</del> )    | 499 ( <del>48.768.8</del> ) |            | 1.22 (0.69          |
| Post graduate        | 5.3 ± 3.33       |         | 226                        | 169 ( <del>16.565.3</del> ) |            | 2.18)               |
|                      |                  |         | 90 ( <del>17.634.7</del> ) |                             | 1.49 (0.86 |                     |
|                      |                  |         |                            |                             | 2.59)      |                     |
|                      |                  |         |                            |                             | 1.27 (0.71 |                     |
|                      |                  |         |                            |                             | 2.29)      |                     |
| Working status       |                  |         |                            |                             |            |                     |
| Yes                  | 4.9 ± 3.07       | < 0.001 | 87 ( <del>17.129.1</del> ) | 212 ( <del>20.770.9</del> ) | 0.09       | 1.00                |
| No                   | 5.8 ± 3.11       |         | 423                        | 813 ( <del>79.365.8</del> ) |            | 0.79 (0.60          |
|                      |                  |         | ( <del>82.934.2</del> )    |                             | 1.04)      |                     |
| EPDS                 |                  |         |                            |                             |            |                     |
| < 11                 | -                | -       | 460                        | 972 ( <del>94.767.9</del> ) | 0.001      | 1.00                |
| ≥ 11                 | -                |         | ( <del>90.032.1</del> )    | 54 ( <del>5.351.4</del> )   |            | 0.50 (0.34          |
|                      |                  |         | 51 ( <del>10.048.6</del> ) |                             |            | 0.75)               |
| Sex of the newborn   |                  |         |                            |                             |            |                     |
| Male                 | 5.4 ± 2.87       | < 0.001 | 249                        | 606 ( <del>59.170.9</del> ) | < 0.001    | 1.00                |
| Female               | 6.0 ± 3.39       |         | ( <del>48.729.1</del> )    | 420 ( <del>40.961.6</del> ) |            | 0.66 (0.34          |

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|                               |            |      |                                |                             |        |                         |
|-------------------------------|------------|------|--------------------------------|-----------------------------|--------|-------------------------|
|                               |            |      | 262<br>( <del>51.338.4</del> ) |                             |        | 0.75)                   |
| Sex of the newborn –<br>Primi |            |      |                                |                             |        |                         |
| Male                          | 5.7 ± 2.68 |      | 163<br>( <del>81.435.7</del> ) | 294 ( <del>54.964.3</del> ) |        | 1.00                    |
| Female                        | 5.6 ± 3.27 | 0.87 | 154<br>( <del>48.639.0</del> ) | 241 ( <del>45.161.0</del> ) | 0.32   | 0.87 (0.66<br>1.15)     |
| No siblings                   |            |      | 317( <del>62.037.2</del> )     | 535( <del>52.1262.7</del> ) |        | 1.00                    |
| MM                            | 4.9 ± 3.49 |      | 17 ( <del>3.315.9</del> )      | 90 ( <del>84.18</del> )     |        | 3.1 (1.83 5.36)         |
| MF                            | 5.8 ± 3.4  |      | 17 ( <del>3.323.9</del> )      | 54 ( <del>5.376.1</del> )   |        | 1.9(1.07 1.30)          |
| FM                            | 5.4 ± 3.59 |      | 24 ( <del>4.722.6</del> )      | 82 ( <del>8.077.4</del> )   |        | 2.0 (1.26 3.26)         |
| FF                            | 6.6 ± 3.39 |      | 14 ( <del>2.740.0</del> )      | 21 ( <del>2.060.0</del> )   |        | 0.89 (0.45              |
| >2 children                   | 5.8 ± 3.14 | 0.06 | 122( <del>23.933.3</del> )     | 244 ( <del>23.866.7</del> ) | <0.001 | 1.77)<br>1.2(0.92 1.53) |

M = male, F = female, MM = 2<sup>nd</sup> male child, FF = 2<sup>nd</sup> female child, FM = male child after a female child

**Table 2: Birth order 2 or more**

| <u>Characteristic</u> | <u>EPDS (Mean ± SD)</u> | <u>P</u>        | <u>No EBF</u>     | <u>EBF</u>        | <u>P</u>        | <u>Odds Ratio (95% CI)</u> |
|-----------------------|-------------------------|-----------------|-------------------|-------------------|-----------------|----------------------------|
| <u>Male sib</u>       | <u>5.21±3.52</u>        |                 | <u>52 (26.8)</u>  | <u>191 (38.9)</u> |                 | <u>1.00</u>                |
| <u>No Male sib</u>    | <u>5.9±3.2</u>          | <u>&lt;0.01</u> | <u>142 (73.2)</u> | <u>300 (61.1)</u> | <u>&lt;0.01</u> | <u>0.58 (0.40-0.83)</u>    |

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**Table 3: Breastfeeding by EPPDS and sex of child**

| <u>Characteristic</u> | <u>EBF in males</u>    | <u>EBF in females</u>  | <u>P</u>     |
|-----------------------|------------------------|------------------------|--------------|
| <u>EPDS &lt;11</u>    | <u>583/815 (71.5%)</u> | <u>389/617 (63.0%)</u> | <u>0.001</u> |
| <u>EPDS ≥ 11</u>      | <u>23/40 (57.5%)</u>   | <u>31/65 (47.7%)</u>   | <u>0.33</u>  |

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**Table 4: Multiple Logistic Regression Analysis**

| <u>bf</u> | <u>Odds Ratio</u> | <u>Std. Err.</u> | <u>z</u> | <u>P&gt; z </u> | <u>[95% Conf. Interval]</u> |
|-----------|-------------------|------------------|----------|-----------------|-----------------------------|
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|           |          |          |       |       |          |          |
|-----------|----------|----------|-------|-------|----------|----------|
| sex       | .6900392 | .0761006 | -3.36 | 0.001 | .5559035 | .8565409 |
| high epds | .5326528 | .1094171 | -3.07 | 0.002 | .3561157 | .7967046 |
| low bwt   | .719286  | .1005456 | -2.36 | 0.018 | .5469104 | .9459912 |

**Table 5: Edinburgh Postnatal Depression Scale**

**INSTRUCTIONS FOR USERS**

- The mother is asked to underline the response that comes closest to how she has been feeling in the previous 7 days.
- All 10 items must be completed.
- Care should be taken to avoid the possibility of the mother discussing her answers with others.
- The mother should complete the scale herself, unless she has limited English or has difficulty with reading.
- The Edinburgh Postnatal Depression Scale may be used at 6–8 weeks to screen postnatal women. The child health clinic, a postnatal checkup, or a home visit may provide a suitable opportunity for its completion.

Edinburgh Postnatal Depression Scale

- Name:
- Address:
- Baby's age:

Because you have recently had a baby, we would like to know how you are feeling. Please underline the answer that comes closest to how you have felt in the past 7 days, not just how you feel today.

Here is an example, already completed.

- I have felt happy:
- Yes, all the time
- Yes, most of the time
- No, not very often
- No, not at all

This would mean: "I have felt happy most of the time" during the past week. Please complete the other questions in the same way.

In the past 7 days:

- I have been able to laugh and see the funny side of things

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- As much as I always could
  - Not quite so much now
  - Definitely not so much now
  - Not at all
  - 2. I have looked forward with enjoyment to things
  - As much as I ever did
  - Rather less than I used to
  - Definitely less than I used to
  - Hardly at all
  - \*3. I have blamed myself unnecessarily when things went wrong
  - Yes, most of the time
  - Yes, some of the time
  - Not very often
  - No, never
  - 4. I have been anxious or worried for no good reason
  - No, not at all
  - Hardly ever
  - Yes, sometimes
  - Yes, very often
  - \*5. I have felt scared or panicky for no very good reason
  - Yes, quite a lot
  - Yes, sometimes
  - No, not much
  - No, not at all
  - \*6. Things have been getting on top of me
  - Yes, most of the time I haven't been able to cope at all
  - Yes, sometimes I haven't been coping as well as usual
  - No, most of the time I have coped quite well
  - No, I have been coping as well as ever
  - \*7. I have been so unhappy that I have had difficulty sleeping
  - Yes, most of the time
  - Yes, sometimes
  - Not very often
  - No, not at all

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- **\*8.** I have felt sad or miserable
- Yes, most of the time
- Yes, quite often
- Not very often
- No, not at all
- **\*9.** I have been so unhappy that I have been crying
- Yes, most of the time
- Yes, quite often
- Only occasionally
- No, never
- **\*10.** The thought of harming myself has occurred to me
- Yes, quite often
- Sometimes
- Hardly ever
- Never

Response categories are scored 0, 1, 2, and 3 according to increased severity of the symptom. Items marked with an asterisk (\*) are reverse scored (i.e., 3, 2, 1, and 0). The total score is calculated by adding the scores for each of the 10 items.

(34)(Permitted for general use)

**Table 6: ISCO-88 major groups and skill level**

| <u>Major group</u>                                   | <u>ISCO skill levels</u> |
|--|--------------------------|
| <u>1. Legislators, senior officials and managers</u> | <u>-</u>                 |
| <u>2. Professionals</u>                              | <u>4th</u>               |
| <u>3. Technicians and associate professionals</u>    | <u>3rd</u>               |
| <u>4. Clerks</u>                                     | <u>2nd</u>               |

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5. Service workers and shop and market sales worker 2nd

6. Skill agricultural and fishery workers 2nd

7. Craft and related workers 2nd

8. Plants and machine operators and assemblers 2nd

9. Elementary occupations 1st

10. Armed forces -

(22)

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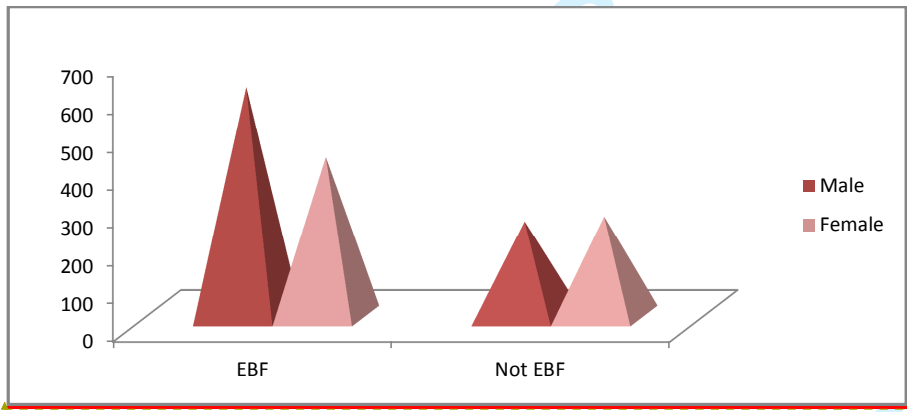
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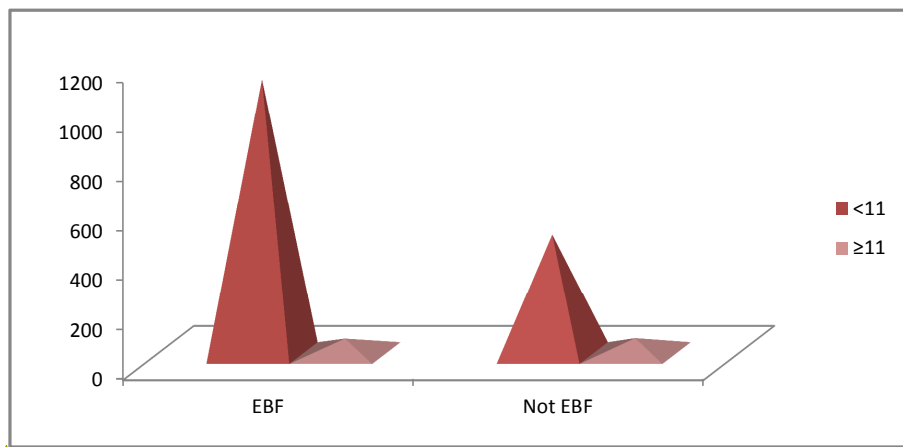
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**Fig 1: Breast feeding and sex of the child**

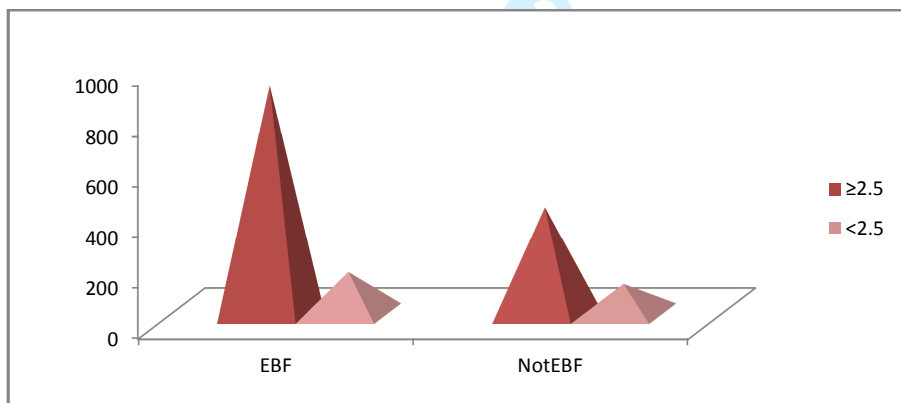


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**Fig 2: Breast feeding and postpartum depression**

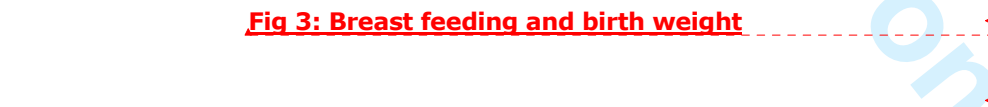


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**Fig 3: Breast feeding and birth weight**



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**REFERENCES:**

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- 1  
2  
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5  
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7 1. American Academy of Paediatrics. Work Group on Breastfeeding.  
8 Breastfeeding and the Use of Human Milk. PEDIATRICS; 1997, Vol. 100  
9 No. 6 pp. 1035-1039.
- 10  
11  
12  
13 2. Huffman SL, Zehner ER, Victora C. Can improvements in breast-feeding  
14 practices reduce neonatal mortality in developing countries? Midwifery.  
15 2001; 17:80-92.
- 16  
17  
18  
19 3. Sheehan D, Bridle B, Hillier T, Feightner K, Hayward S, Lee KS, Krueger  
20 P, Sword W, James M. Breastfeeding outcomes of women following  
21 uncomplicated birth in Hamilton-Wentworth. Can J Public Health 1999;  
22 90(6):408.
- 23  
24  
25  
26  
27 4. Anderson GC, Moore E, Hepworth J, Bergman N. Early skin-to-skin  
28 contact for mothers and their healthy newborn infants. Cochrane  
29 Database Syst Rev. 2003;(2):CD003519
- 30  
31  
32  
33 5. Unicef. Breastfeeding – The Remarkable First Hour Of Life. Malasia. Unicef  
34 2007. [http://www.unicef.org](http://www.unicef.org/malaysia/Breastfeeding_First_Hour_of_Life.pdf)  
35 /malaysia  
36 /Breastfeeding\_First\_Hour\_of\_Life.pdf , Accessed on 27/6/12)
- 37  
38  
39 6. Unicef. Baby Friendly Hospital Initiative Revised, updated and expanded  
40 for integrated care. New York. World Health Organization and UNICEF  
41 2009. [http://www.unicef.org/nutrition/files/BFHI\\_2009\\_s4.pdf](http://www.unicef.org/nutrition/files/BFHI_2009_s4.pdf) (Accessed  
42 27/6/12)
- 43  
44  
45  
46 7. McLearn KT, Minkovitz CS, Strobino DM, Marks E, Hou W. Maternal  
47 depressive symptoms at 2 to 4 months post partum and early parenting  
48 practices. Arch Pediatr Adolesc Med. 2006; 160:279-848.  
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60
8. [Ip S, Chung M, Raman G, Chew P, Magula N, DeVine D, Trikalinos T, Lau J. Breastfeeding and maternal and infant health outcomes in developed countries. Evid Rep Technol Assess . 2007 ;\( 153\):1-186.](#)
9. [A-C Bernard-Bonnin; Canadian Paediatric Society, Mental Health and Developmental Disabilities Committee Paediatr Child Health 2004;9\(8\):575-83](#)
10. [Melinda Smith, M.A., Jeanne Segal. Postpartum Depression and the Baby Blue: Symptoms, Treatment, and Support for New Moms. www.helpguide.org/mental/postpartum\\_depression.htm. \(Accessed on 10/3/13\)](#)
11. [U. Ottawa. Postpartum depression .www.med.uottawa.ca/sim/data/Depression\\_postpartum\\_e.htm \(Accessed on 3/10/13\)](#)
12. [Murray D, Cox JL. Screening for depression during pregnancy with the Edinburgh Depression Scale \(EPDS\). J Repro Infant Psychol 1990; 8, 99-107](#)
13. [Teissèdre F, Chabrol H. Detecting women at risk for postnatal depression using the Edinburgh Postnatal Depression Scale at 2 to 3 days postpartum. Can J Psychiatry. 2004 Jan; 49\(1\):51-419.](#)
14. [Dennis CL, McQueen K. Does maternal postpartum depressive symptomatology influence infant feeding outcomes? Acta Paediatr. 2007; 96:590-4.](#)
15. [Nayar U. Doomed before Birth: Study of Declining Sex Ratio in the Age Group 0-6 Years in Selected Districts of Punjab and Haryana. New Delhi : NCERT; Department of Women's Studies. 1995. pp. 287](#)

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7 [16.Sahni M, Verma N, Narula D, Varghese RM, Sreenivas V, Puliye J. Missing girls in India: infanticide, feticide and made-to-order pregnancies? Insights from hospital-based sex-ratio-at-birth over the last century. PLoS One. 2008 21;3:e2224.](#)
- 8  
9  
10  
11  
12  
13  
14 [17. Manchanda S, Saikia B, Gupta N, Chowdhary S, Puliye J. Sex ratio at birth in India, its relation to birth order, sex of previous children and use of indigenous medicine. PLoS One. 2011;6\(6\):e20097. Epub 2011 Jun 15.](#)
- 15  
16  
17  
18  
19  
20 [18.Jayachandran S, Kuziemko I. Why do mothers breastfeed girls less than boys? Evidence and implications for child health in India. Q J Econ. 2011; 126:1485-1538.](#)
- 21  
22  
23  
24  
25  
26 [19. Hewitt C, Gilbody S, Brealey S, Paulden M, Palmer S, Mann R, Green J, Morrell J, Barkham M, Light K, Richards D. Methods to identify postnatal depression in primary care: an integrated evidence synthesis and value of information analysis. Health Technol Assess. 2009; 13:1-145, 147-230.](#)
- 27  
28  
29  
30  
31  
32 [20. Dubey C, Gupta N, Bhasin S, Muthal RA, Arora R . Prevalence and associated risk factors for postpartum depression in women attending a tertiary hospital, Delhi, India. Int J Soc Psychiatry. 2011 Aug 5.](#)
- 33  
34  
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38 [21. Nagpal J, Dhar RS, Sinha S, Bhargava V, Sachdeva A, Bhartia A. An exploratory study to evaluate the utility of an adapted Mother Generated Index \(MGI\) in assessment of postpartum quality of life in India. Health Qual Life Outcomes. 2008 Dec 2; 6:107.](#)
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46 [22. Warwick Institiue For Employment Research. Major Groups and Skill Levels ISCO 88 Guide Section 2; <http://www2.warwick.ac.uk/fac/soc/ier/research/links/isco88/english/s2/>, \(Accessed on 2/7/2012\)](#)
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23. [Confidence Interval Analysis \(CIA\) Software. Available at www.som.soton.ac.uk/cia . \(Accessed on 10/4/12\)](http://www.som.soton.ac.uk/cia)
24. [Creative Research Systems. Sample size calculator. Available at http://www.surveysystem.com/sscalc.htm#one.\( Accessed on 12/4/12\)](http://www.surveysystem.com/sscalc.htm#one)
25. [Jha P, Kumar R, Vasa P, Dhingra N, Thiruchelvam D, Moineddin R.Low female\[corrected\]-to-male \[corrected\] sex ratio of children born in India: national survey of 1.1 million households. Lancet. 2006 21;367:211-8.](#)
26. [Kimani-Murage EW, Madise NJ, Fotso JC, Kyobutungi C, Mutua MK, Gitau TM, Yatich N. Patterns and determinants of breastfeeding and complementary feeding practices in urban informal settlements, Nairobi Kenya. BMC Public Health. 2011 26;11:396](#)
27. [Adewuya AO, Fatoye FO, Ola BA, Ijaodola OR, Ibigbami SM.Sociodemographic and obstetric risk factors for postpartum depressive symptoms in Nigerian women. J Psychiatr Pract. 2005; 11:353-8.](#)
28. [Chandran M, Thayan P, Muliyl J, Abraham S. Post-partum depression in a cohort of women from a rural area of Tamil Nadu, India. Incidence and risk factors. Br J Psychiatry. 2002; 181:499-504](#)
29. [Kheirabadi GR, Maracy MR, Barekatin M, Salehi M, Sadri GH, Kelishadi M, Cassy P. Risk factors of postpartum depression in rural areas of Isfahan Province, Iran.Arch Iran Med. 2009; 12:461-7.](#)
30. [Yaron Y, Lehavi O, Orr-Urtreger A, Gull I, Lessing JB, Amit A, Ben-Yosef D. Maternal serum HCG is higher in the presence of a female fetus as early as week 3 post-fertilization. Hum Reprod. 2002 Feb;17\(2\):485-9.](#)

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7 31.Hendrick V, Altshuler LL, Suri R. Hormonal changes in the postpartum  
8 and implications for postpartum depression. Psychosomatics. 1998 Mar-  
9 Apr; 39(2):93-101.

10  
11 32.Dennis CL, McQueen K. The relationship between infant-feeding outcomes  
12 and postpartum depression: a qualitative systematic review.Pediatrics.  
13 2009; 123e736-51.

14  
15 33. Henderson JJ, Evans SF, Straton JA, Priest SR, Hagan R. Impact of  
16 postnatal depression on breastfeeding duration.Birth. 2003  
17 Sep;30(3):175-80. Erratum in: Birth. 2004; 31:76.

18  
19 34.Currie ML, Rademacher R: The pediatrician's role in recognizing and  
20 intervening in postpartum depression. Pediatr Clin North Am  
21 2004;51:785-801.

#### 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 **REFERENCE:**

37  
38 1. American Academy of Paediatrics. Work Group on Breastfeeding.  
39 Breastfeeding and the Use of Human Milk. PEDIATRICS; 1997, Vol. 100 No. 6  
40 pp. 1035-1039.

41  
42  
43  
44  
45 2. Huffman SL, Zehner ER, Victora C. Can improvements in breast feeding  
46 practices reduce neonatal mortality in developing countries? Midwifery. 2001;  
47 17:80-92.

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3. Sheehan D, Bridle B, Hillier T, Feightner K, Hayward S, Lee KS, Krueger P, Sword W, James M. Breastfeeding outcomes of women following uncomplicated birth in Hamilton-Wentworth. *Can J Public Health* 1999; 90(6):408.

4. Anderson GC, Moore E, Hepworth J, Bergman N. Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database Syst Rev*. 2003;(2):CD003519

5. Unicef. Breastfeeding—The Remarkable First Hour Of Life. Malasia. Unicef 2007. [http://www.unicef.org/malaysia/Breastfeeding\\_First\\_Hour\\_of\\_Life.pdf](http://www.unicef.org/malaysia/Breastfeeding_First_Hour_of_Life.pdf). Accessed on 27/6/12

6. Unicef. Baby Friendly Hospital Initiative Revised, updated and expanded for integrated care. New York. World Health Organization and UNICEF 2009. [http://www.unicef.org/nutrition/files/BFHI\\_2009\\_s4.pdf](http://www.unicef.org/nutrition/files/BFHI_2009_s4.pdf) (Accessed 27/6/12)

7. McLearn KT, Minkovitz CS, Strobino DM, Marks E, Hou W. Maternal depressive symptoms at 2 to 4 months post partum and early parenting practices. *Arch Pediatr Adolesc Med*. 2006; 160:279-848.

8. Ip S, Chung M, Raman G, Chew P, Magula N, DeVine D, Trikalinos T, Lau J. Breastfeeding and maternal and infant health outcomes in developed countries. *Evid Rep Technol Assess*. 2007;(153):1-186.

9. A-C Bernard-Bonnin; Canadian Paediatric Society, Mental Health and Developmental Disabilities Committee. *Paediatr Child Health* 2004;9(8):575-83

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10. Melinda Smith, M.A., Jeanne Segal. **Postpartum Depression and the Baby Blue; Symptoms, Treatment, and Support for New Moms.** [www.helpguide.org/mental/postpartum-depression.htm](http://www.helpguide.org/mental/postpartum-depression.htm). (Accessed on 10/3/13).

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11. U. Ottawa. Postpartum depression [www.med.uottawa.ca/sim/data/Depression\\_postpartum\\_e.htm](http://www.med.uottawa.ca/sim/data/Depression_postpartum_e.htm) (Accessed on 3/10/13)

12. Murray D, Cox JL. Screening for depression during pregnancy with the Edinburgh Depression Scale (EPDS). J Repro Infant Psychol 1990; 8, 99-107

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21. Nagpal J, Dhar RS, Sinha S, Bhargava V, Sachdeva A, Bhartia A. An exploratory study to evaluate the utility of an adapted Mother Generated Index (MGI) in assessment of postpartum quality of life in India. *Health Qual Life Outcomes*. 2008 Dec 2; 6:107.
22. Warwick Institute For Employment Research. Major Groups and Skill Levels ISCO-88 Guide Section 2; <http://www2.warwick.ac.uk/fac/soc/ier/research/links/isco88/english/s2/>; (Accessed on 2/7/2012)
23. Confidence Interval Analysis (CIA) Software. Available at [www.som.soton.ac.uk/cia](http://www.som.soton.ac.uk/cia). (Accessed on 10/4/12)
24. Creative Research Systems. Sample size calculator. Available at <http://www.surveysystem.com/sscalc.htm#one>. (Accessed on 12/4/12)
25. Jha P, Kumar R, Vasa P, Dhingra N, Thiruchelvam D, Moineddin R. Low female[corrected] to male [corrected] sex ratio of children born in India: national survey of 1.1 million households. *Lancet*. 2006 21; 367:211-8.
26. Kimani-Murage EW, Madise NJ, Fotso JC, Kyobutungi C, Mutua MK, Gitau TM, Yatich N. Patterns and determinants of breastfeeding and complementary feeding practices in urban informal settlements, Nairobi Kenya. *BMC Public Health*. 2011 26; 11:396
27. Adewuya AO, Fatoye FO, Ola BA, Ijaodola OR, Ibigbami SM. Sociodemographic and obstetric risk factors for postpartum depressive symptoms in Nigerian women. *J Psychiatr Pract*. 2005; 11:353-8.
28. Chandran M, Thayan P, Muliylil J, Abraham S. Post-partum depression in a cohort of women from a rural area of Tamil Nadu, India. Incidence and risk factors. *Br J Psychiatry*. 2002; 181:499-504

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**Article focus:**

We hypothesise that in a society with a pro-male bias there would be:

1. Higher Postnatal Depression score in mothers of girl babies.
2. Less breastfeeding of girl children.

**Key Message:**

1. Sex bias was evident in the low sex ratio at birth and the significantly lower ratio in families where first child was a girl.
2. Postnatal depression score were higher after birth of a girl child.
3. There was less exclusive breastfeeding of girl children.
4. Mothers with high postnatal depression score were less likely to breastfeed



**Strength of study:**

1. The postpartum depression was evaluated using a widely validated EPDS scoring system.

**Limitations of study:**

1. It was done in an urban hospital catering mostly to a middle class clientele.

The findings on sex ratio may therefore not be generalisable to the other social groups.

2. We studied the initiation of breastfeeding and exclusive breast feeding in the first 48 hours. More studies are needed to elaborate the effect of sex bias on the duration of breastfeeding.

3. EPDS scoring was done in first 48 hrs and would include mothers with transient postpartum blues not amounting to postpartum depression. Follow up studies are needed to see that how many of them develop significant depression.

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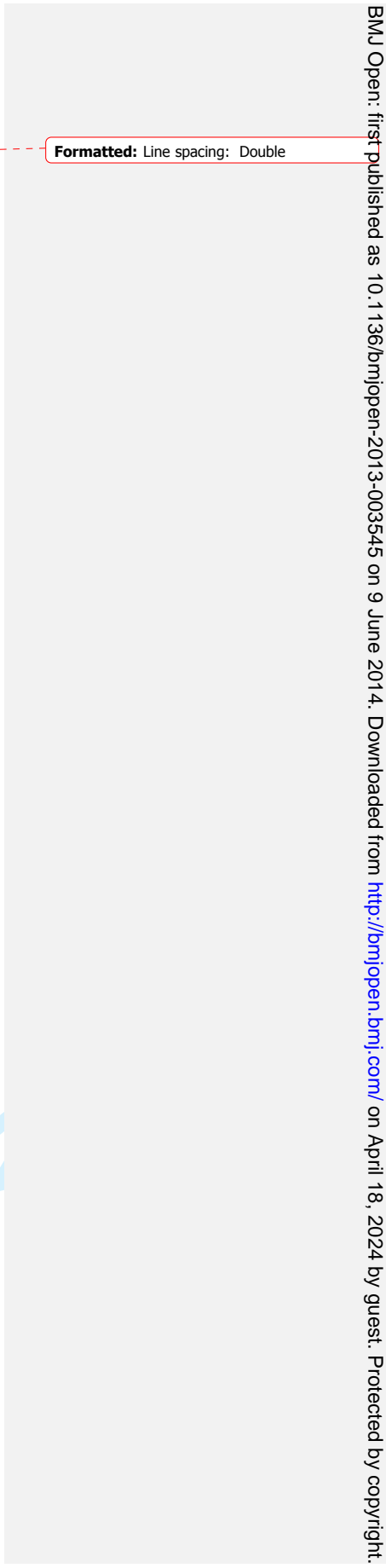
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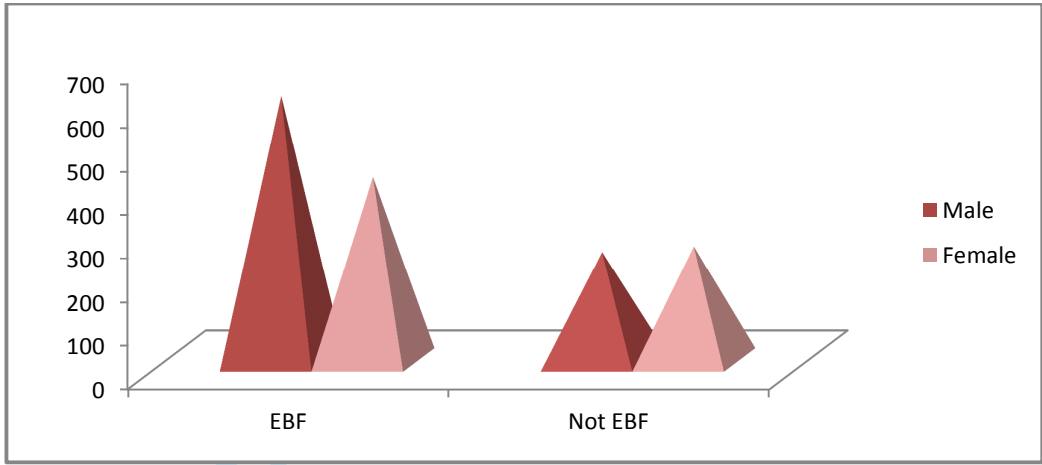
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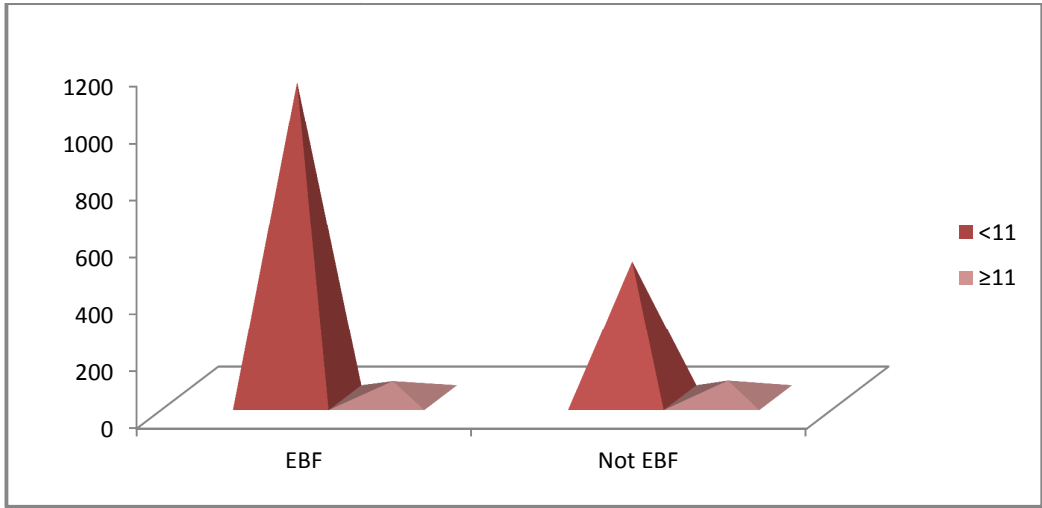
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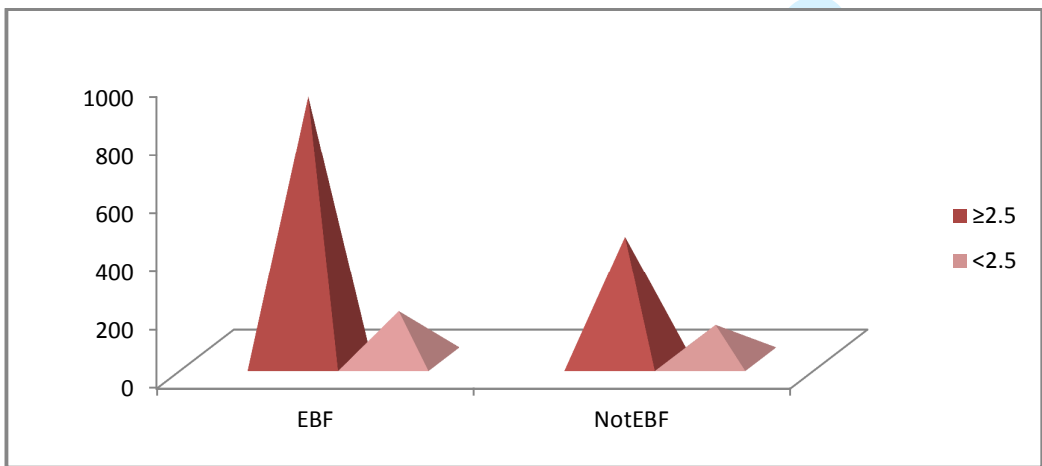
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**Fig 1: Breast feeding and sex of the child**



**Fig 2: Breast feeding and postpartum depression**



**Fig 3: Breast feeding and birth weight**

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**ASSOCIATION OF BIRTH OF GIRLS, POSTPARTUM  
DEPRESSION AND EXCLUSIVE BREASTFEEDING – AN  
OBSERVATIONAL STUDY**

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| Manuscript ID:                  | bmjopen-2013-003545.R2  |
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| Complete List of Authors:       | Jain, Akanksha; St.Stephen's Hospital, Paediatrics<br>Kaur, Prabhjeet; St. Stephen's hospital, Paediatrics<br>Tyagi, Prashant; St. Stephen's hospital, Paediatrics<br>Puliyel, Jacob; St. Stephens Hospital, Pediatrics and Neonatology<br>Sreenivas, Vishnu; AIIMS, Pediatrics |
| <b>Primary Subject Heading</b>: | Paediatrics   |
| Secondary Subject Heading:      | Global health   |
| Keywords:                       | Child protection < PAEDIATRICS, Community child health < PAEDIATRICS, Depression & mood disorders < PSYCHIATRY  |
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***ASSOCIATION OF BIRTH OF GIRLS, POSTPARTUM DEPRESSION  
AND EXCLUSIVE BREASTFEEDING – AN OBSERVATIONAL STUDY***

**Akanksha Jain, Prashant Tyagi, Praphjeet Kaur, Jacob Puliyeel, V.**

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**ABSTRACT**

OBJECTIVES AND HYPOTHESIS: To examine influence of gender of baby on exclusive breastfeeding and incidence of postpartum depression (PPD). We hypothesize that in a society with a male gender bias there may be more PPD and less exclusive breastfeeding of girls.

DESIGN: Prospective study

SETTING: The study was conducted in an urban, tertiary hospital in Delhi.

PARTICIPANTS: Mothers delivering normally with their babies roomed-in. 1537 eligible women participated in the study.

PRIMARY AND SECONDARY OUTCOME MEASURES: Exclusive breastfeeding within first 48 hours of life and score on Edinburgh post partum depression scale (EPDS) were recorded.

RESULTS: 3,466 babies were born in the hospital. There were 792 girls for every 1000 boys. Among primiparous women, sex-ratio was 901 girls per 1000 boys. In second babies the sex-ratio was 737:1000. If the first child was a girl the birth ratio fell to 632. 1026 mothers were exclusively breastfeeding. Exclusive breast feeding of boys was significantly higher (70.8% vs 61.5%  $p < 0.001$ ). The EPDS score was significantly higher with birth of girls (EPDS  $6.0 \pm 3.39$  vs  $5.4 \pm 2.87$   $p < 0.01$ ). Women with EPDS  $> 11$  were less likely to exclusively breast feed ( $p < 0.01$ ).

CONCLUSION: The results point to a pro male gender bias evidenced by a low sex ratio at birth, higher EPDS score in mothers of girls and less breastfeeding of female children.

### **Article Summary**

- The postpartum depression was evaluated using a widely validated EPDS scoring system.
- It was done in an urban hospital catering mostly to a middle class clientele. The findings on sex ratio may therefore not be generalisable to the other social groups.
- We studied the initiation of exclusive breastfeeding in the first 48 hours. More studies are needed to elaborate the effect of sex bias on the duration of breastfeeding.
- EPDS scoring was done in first 48 hrs and would include mothers with transient postpartum blues not amounting to postpartum depression. Follow up studies are needed to see that how many of them develop significant depression.
- Although multiple regression analysis shows that higher depression score and female sex of child is associated with lower odds of exclusive breastfeeding, a causal relationship is not implied.
- High rate of sex selective abortion may complicate the interpretation of results by family composition.

**INTRODUCTION:**

Breast milk is the preferred food for all infants including premature and sick babies (1). UNICEF has promoted breastfeeding initiation within an hour of childbirth (2) (3). It provides nutritional, immunological, developmental and psychological advantages to the child besides health advantages to the mother and economic benefits to the family (1). It establishes skin-to-skin contact providing warmth to the newborn. Suckling at breast stimulates oxytocin release which further increasing flow of milk from breast. Breast milk reduces mortality in the first month of life (4). Early breast feed initiation is also associated with increased exclusive breastfeeding and longer duration of breastfeeding (5). The WHO and UNICEF launched the baby friendly hospital initiative in 1991 to strengthen maternity unit practices to support breastfeeding (6). However in spite of all these promotions and the known benefits of breastfeeding, exclusive breastfeeding and early initiation of breastfeeding are not often practiced. Factors intrinsic to the mother or baby may play a crucial role. One such factor is post partum depression (PPD) and there is evidence that mothers with PPD are less likely to breastfeed (7) (8).

Expression of postpartum depression may extend from the more transient baby blues to a longer lasting depression going on for several weeks (9). In both conditions there are mood swings, crying jags, sadness, insomnia and irritability. (10, 11)

The 10-question Edinburgh Postnatal Depression Scale (EPDS) is a validated, valuable and efficient way of identifying patients at risk for perinatal depression. It can be applied for depression screening during pregnancy. (12) The scale has been used as early as 1<sup>st</sup> or 2<sup>nd</sup> postpartum day in order to screen women at risk

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3 of PPD, by Teissedre F. In his study 1154 women completed EPDS at 2 to 3  
4 postpartum days and again at 4 to 6 weeks postpartum. He found that there was  
5 a highly significant positive correlation between EPDS scores on the two  
6 occasions (Spearman rank correlation:  $r = 0.59$ ,  $P < 0.0001$ ) (13). Although  
7 studies done in the immediate postpartum period are likely to pick up many  
8 cases of postpartum blues, Dennis found that mothers with a EPDS  $>12$  at 1  
9 week postpartum were significantly more likely at 4 and/or 8 weeks to  
10 discontinue breastfeeding, be unsatisfied with their infant feeding method,  
11 experience significant breastfeeding problem and report lower levels of  
12 breastfeeding self-efficacy (14).  
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28 Studies looking at sex ratio at birth have shown that there is a strong gender  
29 bias in India, favouring boys (15) (16) (17). Jayachandran and Kuziemko have  
30 shown that boys tend to be breast fed longer (18). The EPDS score in relation to  
31 sex of the child has not been studied. Also the association between births of girl  
32 babies (in the society with a male sex bias), EPDS score soon after birth and  
33 exclusive breast feeding have not been examined previously. We hypothesize  
34 that there may be higher EPDS score and less exclusive early breast feeding of  
35 girl children. Recognition of these possible barriers to exclusive breast feeding  
36 may allow more focussed support to mothers that will promote breast feeding  
37 and improve survival of the girl baby.  
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50 **Ethics statement:** This study was approved by the St Stephen's Hospital  
51 Research Ethics Committee. Informed written consent was obtained from  
52 participants. The data and the names of the respondents are kept confidential.  
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57 The paper we propose to publish does not contain any identifying information, so  
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3 no response the patient made can be attributed to any of the participants in the  
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5 study.  
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### 8 **MATERIALS AND METHODS:**

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10 This was an observational cross sectional study conducted between August 2010  
11 and July 2011, at St. Stephens Hospital, Delhi. Only mothers delivering normally  
12 with their babies roomed-in were invited to participate. Mothers who consented  
13 to participate were interviewed on each of the first 2 days after delivery to  
14 enquire about breast feeding. The weight of the baby, sex of the child, mother's  
15 education, history of previous births and socio-economic status were recorded.  
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18 Mothers were administered Edinburgh Post Partum Depression Scale (EPDS) on  
19 day 2(19). A Hindi translation of the EPDS was administered to mother who  
20 preferred Hindi (20). This translation has been back translated and validated  
21 previously (21). The outcomes measured were exclusive breastfeeding in first 48  
22 hours and postpartum depression on EPDS.  
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25 The socioeconomic status was assigned grades 1 to 5 taking in to account the  
26 skill levels and formal education using the 'Major Groups and Skill Levels  
27 Classification' of University of Warwick (Table 5). ISCO-88 skill level 4 is  
28 considered grade 1 of socio-economic status, skill level 3 - grade 2, skill level 2 -  
29 grade 4, skill level 4 and those not working - grade 5 (22).  
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32 The education level was also graded as follows - grade 1: mothers who have not  
33 completed primary school education, grade 2: primary school graduates up to  
34 secondary school, grade 3: if they had passed up to higher secondary education,  
35 grade 4: college graduates and grade 5: mother who have completed a  
36 postgraduate degree course.  
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3 Correlates of exclusive breastfeeding were examined. The incidence of  
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5 exclusive breastfeeding in boys and girls was examined separately and also for  
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7 primi-parous mothers, separately from mothers who have had previous babies.  
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9 EPDS score in relation to sex of the child was also examined. Depression score  
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11 above 11 on EPDS was considered as significant using cut-off determined  
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13 previously by Teissedre (13). Pearson chi square test was used to look for  
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15 significance. Odds ratio and 95% CI of exclusive breastfeeding were calculated.  
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17 For proportions; 95% CI of the observed proportion is reported. Multiple  
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19 regression analysis of correlates of exclusive breastfeeding was also done. CI  
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21 was calculated using CIA software (23).  
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25 **Sample size calculation:** We calculated that in order to get results that reflect  
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27 the target population at the 95% confidence level with a margin of error of less  
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29 than 2.5%, we would need to interview 1537 mothers (24).  
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**RESULTS:**

During the study period 3,466 babies were born at the hospital. There were only 792 girls for every 1000 boys. Among women delivering their first babies, there were 901 girls per 1000 boys. Among mothers delivering their second babies the sex ratio was 737 girls to 1000 boys. If first child was a girl the ratio in the second delivery fell to 632:1000 but if the first child was a boy the sex ratio in second children was 841:1000.

1537 mothers of singleton babies were enrolled in the study. The sex ratio in the study sample 797 girls per 1000 boys was similar to the sex ratio of overall deliveries. 1026 mothers in the study group were exclusively breastfeeding their babies.

Babies with birth weight 2.5 kg or heavier were more likely to be exclusively breast fed compared to those less than 2.5 kg (low birth weight) (68.2% vs 59.8%,  $p < 0.01$ ). Multiparous mothers were more likely to be exclusively breastfeeding than primiparous mothers (71.6% vs 62.8%, Difference = 0.089, 95% CI= 0.042 to 0.135).

Exclusive breast feeding was significantly more among mothers of boys as compared to those of girls (70.8 % vs 61.5 %  $p < 0.001$ ). Gender of baby had less influence on exclusive breastfeeding of first born children. 64.3% of primi boy babies and 61.0% of primi girl babies were exclusively breastfed ( $p = 0.32$ ).

If the first born was a girl and second baby was also a girl, 60% of second children were exclusively breastfed compared to 77.3%, if the second child was a boy ( $p = 0.05$ ). The chances of exclusively breastfeeding the baby was highest if there was a boy sibling in the family; 78.6% compared to 67.9%, if there was no boy ( $p < 0.01$ ).

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3 No significant difference in exclusive breastfeeding was found related to maternal  
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5 age, socioeconomic status, maternal education, working status.  
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10 The EPDS score was significantly higher in mothers giving birth to a girl child  
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12 (mean EPDS score  $6.0 \pm 3.39$  compared to  $5.4 \pm 2.87$ ,  $p < 0.01$ ). The  
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14 depression score was significantly lower in mothers with at least one male child  
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16 when compared to those with no male child ( $5.21 \pm 3.25$  vs  $5.9 \pm 3.2$ ,  $p < 0.01$ ).  
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18 Significantly more mothers of girl babies had an EPDS score higher than 11  
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20 compared to mothers of boys (9.7% vs 5.4%, difference in proportion = -0.045,  
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22 CI = -0.072 to -0.019).  
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26 Higher EPDS score is associated with exclusive breastfeeding rates. Only 52.4%  
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28 mothers with score  $\geq 11$  were exclusively breastfeeding compared to 67.8 % in  
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30 those with score  $< 11$  ( $p < 0.01$ ).  
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36 Multiple logistic regression analysis indicated that birth of a female baby (OR =  
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38 0.69, 95% CI: 0.56 to 0.87), high EPDS (OR = 0.53, 95% CI: 0.36 to 0.80) and  
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40 low birth weight (OR = 0.72, 95% CI: 0.55 to 0.95) are associated with lower  
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42 odds of exclusive breastfeeding. This analysis suggests that sex of the baby,  
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44 EPDS score and birth weight are significant, independent factors influencing EBF.  
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## **DISCUSSION:**

Low female to male sex ratio is used as an index of the sex bias in the community and can result from antenatal sex screening and selective abortion of female babies (25). In India, male: female sex ratio is 914:1000. Sex ratio at birth is a better index of antenatal sex selection than the overall sex ratio (20). Previous studies have shown that the sex ratio was particularly low in 2<sup>nd</sup> children if the first was a girl (17) (26).

The same phenomenon was seen again in the fresh cohort studied here. The sex ratio in 2<sup>nd</sup> order deliveries was 792 girls to 1000 boys but it was 632:1000 when 1<sup>st</sup> child was a girl child.

There was a male bias in breastfeeding too. More boys were being exclusively breastfed than girls. Jaychandran and Kuziemko hypothesise that since breastfeeding inhibits post-natal fertility, a mother might limit the nursing of an infant if she wants to continue having children. Mothers of girl children may want a boy soon and so may limit the duration of her feeding (18). Kimani et al also found sex of the child to be one of the factors for suboptimal breastfeeding in Kenya (n = 4299) (27).

### **Gender of baby and PPD**

Our study found that depression score was higher in mothers of girls. The influence of gender of baby on postpartum depression in mothers has been reported before. Adewuya et al in a study on Nigerian women found female sex of the baby was one of the predictors for PPD (OR 2.74, CI 1.87-4.03) (28). Chandran et al in Tamilnadu south India showed that birth of a daughter, when a son was desired, was important risk factors for depression (29). In a study of

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3 women in Iran also gender of the child was found to be an important factor  
4 contributing to PPD (30). Mothers who conceive female fetus have higher level of  
5 beta hcg. This along with other similar hormonal changes may be a biological  
6 explanation for the child gender to affect PPD. (31) (32) However this has not  
7 been elucidated clearly as yet.  
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17 Our study of EPDS was done on the second day after delivery. The mothers with  
18 low EPDS score could be those with postpartum blues and not all of them will  
19 have persistent postpartum depression. Only follow up study will identify those  
20 with persistent postpartum depression. Our study protocol aimed at  
21 investigating early breastfeeding did not examine the issue of long lasting  
22 depression in mothers of girl children.  
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### 30 **PPD and Breast feeding**

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32 We found that mothers with higher EPDS score were less likely to be exclusively  
33 breastfeeding. The effects of PPD on exclusive breastfeeding have been reported  
34 earlier. Dennis also found that mothers with a EPDS >12 at 1 week postpartum  
35 were significantly more likely at 4 and/or 8 weeks to discontinue breastfeeding,  
36 be unsatisfied with their infant feeding method, experience significant  
37 breastfeeding problem and report lower levels of breastfeeding self-efficacy (33).  
38 In a cohort of 1745 Australian women it was found that median duration of  
39 breastfeeding was 26 weeks for women with early-onset depression, 28 weeks  
40 for women with late-onset depression, and 39 weeks for women without  
41 depression (34). Dennis and McQueen found maternal depression to be  
42 associated with delayed initiation (33) and Ip and colleagues found its  
43 association with early discontinuation (8) of breast feeding.  
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3 The birth of the girl child is associated with greater depression, and the lower  
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5 exclusive breastfeeding in girls could be mediated by the depression. To examine  
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7 the effect of depression on exclusive breastfeeding we studied exclusive  
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9 breastfeeding in mothers of girls who had high EPDS score against those with  
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11 low score. We found that in mothers of girls with higher depression score, only  
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13 47.7% were exclusively breastfeeding compared to 63.0% with low depression  
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15 levels (Difference in proportion= 0.154, 95% CI = -0.26 to -0.028). To look at  
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17 the influence of sex of the child on exclusive breastfeeding independent of  
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19 associated depression, we performed multiple logistic regression analysis which  
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21 showed that female sex of the child was independently associated with lower  
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23 odds of exclusive breastfeeding even after adjusting for depression. The  
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25 comparison between the female odds ratio on table1 (0.66) and the one on table  
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27 4 (0.69) suggests that controlling for PPD and birth weight does not affect the  
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29 gender difference in exclusive breastfeeding much.  
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34 The results point to a pro male gender bias. Mothers of girls may need more  
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36 help to overcome postpartum depression and for improving breastfeeding rates.  
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38 This in turn could enhance the survival of girl children and improve the sex ratio  
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40 in the country.  
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44 This study does suffer from some shortcomings in as much as it was done in an  
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46 urban hospital catering mostly to a middle class clientele. The findings on sex  
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48 ratio may therefore not be generalisable to the other social groups. Studies in  
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50 other populations are needed to confirm our findings.  
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54 We studied exclusive breast feeding in the first 48 hours. More studies are  
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56 needed to elaborate the effect of sex bias on the duration of breastfeeding.  
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3 We studied the EPDS in mothers within 48 hours of delivery. Many of those with  
4 high scores may be suffering from post partum blues rather than full fledged  
5 post partum depression. Further studies done later in the post natal period need  
6 to be done to examine how many of these mothers with high initial scores have  
7 longer lasting PPD. Although multiple regression analysis shows that higher  
8 depression score and female sex of child is associated with lower odds of  
9 exclusive breastfeeding, a causal relationship is not implied.  
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19 In India the sex ratio is affected by antenatal sex determination and sex  
20 selective feticide (25). High rate of sex selective abortion may complicate the  
21 interpretation of results by family composition.  
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**TABLE 1: Table showing correlates of Exclusive breast feeding and Postpartum depression**

| Characteristic                | EPDS<br>(Mean ± SD) | P       | Exclusive Breast Feeding |                   |         |                        |
|-------------------------------|---------------------|---------|--------------------------|-------------------|---------|------------------------|
|                               |                     |         | No<br>(N = 511)          | Yes<br>(N = 1026) | P       | Odds Ratio<br>(95% CI) |
| Maternal age (years)          |                     |         |                          |                   |         |                        |
| < 25                          | 5.8 ± 2.96          | 0.25    | 171 (36.4)               | 299 (63.6)        | 0.16    | 1.00                   |
| 25 – 29                       | 5.5 ± 3.17          |         | 237 (33.3)               | 474 (66.7)        |         | 1.14 (0.90 1.46)       |
| 30 – 34                       | 5.8 ± 3.35          |         | 84 (28.6)                | 210(71.4)         |         | 1.43 (1.04 1.96)       |
| ≥ 35                          | 5.3 ± 2.71          |         | 19 (30.6)                | 43 (69.4)         |         | 1.20 (0.73 2.29)       |
| SES                           |                     |         |                          |                   |         |                        |
| Academic                      | 5.2 ± 3.12          | < 0.001 | 79 (32.4)                | 165 (67.6)        | 0.86    | 1.00                   |
| Vocational                    | 5.2 ± 2.87          |         | 109 (35.4)               | 199 (64.6)        |         | 0.87 (0.61 1.25)       |
| Short education               | 5.5 ± 3.07          |         | 130 (33.2)               | 261 (67.8)        |         | 0.96 (0.68 1.35)       |
| Skilled                       | 6.2 ± 3.18          |         | 147 (31.8)               | 315 (68.2)        |         | 1.03 (0.74 1.43)       |
| Semi/Unskilled                | 5.8 ± 3.42          |         | 45 (34.9)                | 84 (65.1)         |         | 0.89 (0.57 1.40)       |
| Birth weight (Kg)             |                     |         |                          |                   |         |                        |
| ≥ 2.5                         | 5.5 ± 3.18          | < 0.01  | 402 (31.7)               | 865 (68.3)        | <0.01   | 1.00                   |
| < 2.5                         | 6.1 ± 2.98          |         | 108 (40.1)               | 161 (59.9)        |         | 0.69 (0.53 0.91)       |
| Maternal education            |                     |         |                          |                   |         |                        |
| < Primary                     | 6.8 ± 4.14          | < 0.01  | 23 (40.4)                | 34 (59.6)         | 0.44    | 1.00                   |
| Up to Secondary               | 6.0 ± 3.02          |         | 61 (33.3)                | 122 (66.7)        |         | 1.35 (0.73 2.49)       |
| Higher secondary              | 5.8 ± 2.93          |         | 111 (35.6)               | 201 (64.4)        |         | 1.22 (0.69 2.18)       |
| Graduate                      | 5.5 ± 3.03          |         | 226 (31.2)               | 499 (68.8)        |         | 1.49 (0.86 2.59)       |
| Post graduate                 | 5.3 ± 3.33          |         | 90 (34.7)                | 169 (65.3)        |         | 1.27 (0.71 2.29)       |
| Working status                |                     |         |                          |                   |         |                        |
| Yes                           | 4.9 ± 3.07          | < 0.001 | 87 (29.1)                | 212 (70.9)        | 0.09    | 1.00                   |
| No                            | 5.8 ± 3.11          |         | 423 (34.2)               | 813 (65.8)        |         | 0.79 (0.60 1.04)       |
| EPDS                          |                     |         |                          |                   |         |                        |
| < 11                          | -                   | -       | 460 (32.1)               | 972 (67.9)        | 0.001   | 1.00                   |
| ≥ 11                          |                     |         | 51 (48.6)                | 54 (51.4)         |         | 0.50 (0.34 0.75)       |
| Sex of the newborn            |                     |         |                          |                   |         |                        |
| Male                          | 5.4 ± 2.87          | < 0.001 | 249 (29.1)               | 606 (70.9)        | < 0.001 | 1.00                   |
| Female                        | 6.0 ± 3.39          |         | 262 (38.4)               | 420 (61.6)        |         | 0.66 (0.34 0.75)       |
| Sex of the newborn –<br>Primi |                     |         |                          |                   |         |                        |
| Male                          | 5.7 ± 2.68          | 0.87    | 163 (35.7)               | 294 (64.3)        | 0.32    | 1.00                   |
| Female                        | 5.6 ± 3.27          |         | 154 (39.0)               | 241 (61.0)        |         | 0.87 (0.66 1.15)       |
| No siblings                   |                     |         |                          |                   |         |                        |
| MM                            | 4.9 ± 3.49          | 0.06    | 317(37.2)                | 535(62.7)         | <0.001  | 1.00                   |
| MF                            | 5.8 ± 3.4           |         | 17 (15.9.)               | 90 (84.1)         |         | 3.1 (1.83 5.36)        |
| FM                            | 5.4 ± 3.59          |         | 17 (23.9)                | 54 (76.1)         |         | 1.9(1.07 1.30)         |
| FF                            | 6.6 ± 3.39          |         | 24 (22.6)                | 82 (77.4)         |         | 2.0 (1.26 3.26)        |
| >2 children                   | 5.8 ± 3.14          |         | 14 (40.0)                | 21 (60.0)         |         | 0.89 (0.45 1.77)       |
|                               |                     |         | 122(33.3)                | 244 (66.7)        |         | 1.2(0.92 1.53)         |

M = male, F = female, MM = 2<sup>nd</sup> male child, FF = 2<sup>nd</sup> female child, FM = male child after a female child

**Table 2: Birth order 2 or more**

| Characteristic | EPDS (Mean ± SD) | P     | No EBF     | EBF        | P     | Odds Ratio (95% CI) |
|----------------|------------------|-------|------------|------------|-------|---------------------|
| Male sib       | 5.21±3.52        |       | 52 (26.8)  | 191 (38.9) |       | 1.00                |
| No Male sib    | 5.9±3.2          | <0.01 | 142 (73.2) | 300 (61.1) | <0.01 | 0.58 (0.40-0.83)    |

**Table 3: Breastfeeding by EPPDS and sex of child**

| Characteristic | EBF in males    | EBF in females  | P     |
|----------------|-----------------|-----------------|-------|
| EPDS <11       | 583/815 (71.5%) | 389/617 (63.0%) | 0.001 |
| EPDS ≥ 11      | 23/40 (57.5%)   | 31/65 (47.7%)   | 0.33  |

**Table 4: Multiple Logistic Regression Analysis**

| bf        | Odds Ratio | Std. Err. | z     | P> z  | [95% Conf. Interval] |
|-----------|------------|-----------|-------|-------|----------------------|
| sex       | .6900392   | .0761006  | -3.36 | 0.001 | .5559035 .8565409    |
| high_epds | .5326528   | .1094171  | -3.07 | 0.002 | .3561157 .7967046    |
| low_bwt   | .719286    | .1005456  | -2.36 | 0.018 | .5469104 .9459912    |

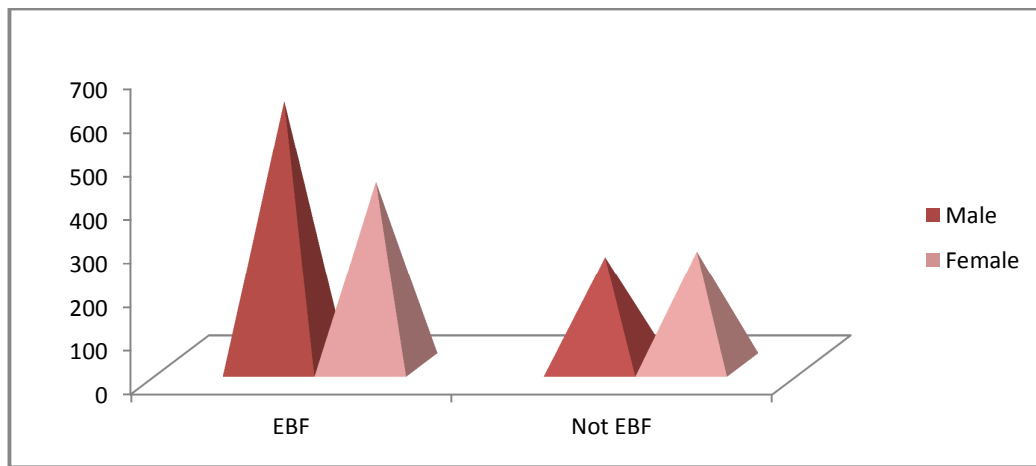
**Table 5: ISCO-88 major groups and skill level**

| Major group | ISCO skill levels |
|-------------|-------------------|
|-------------|-------------------|

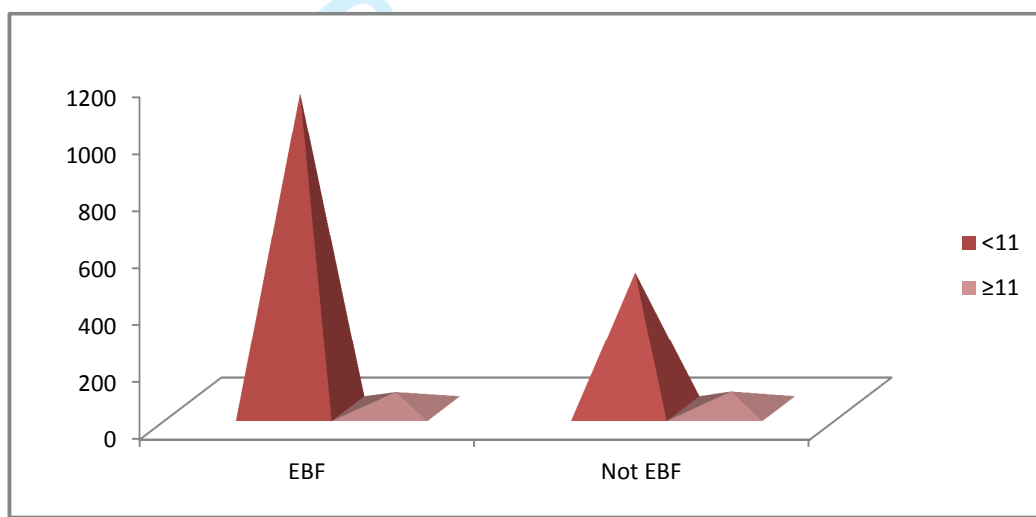
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| 3  | 1. Legislators, senior officials and managers       | -   |
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| 6  | 2. Professionals                                    | 4th |
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| 8  |   |     |
| 9  | 3. Technicians and associate professionals          | 3rd |
| 10 |   |     |
| 11 |   |     |
| 12 | 4. Clerks   | 2nd |
| 13 |   |     |
| 14 |   |     |
| 15 | 5. Service workers and shop and market sales worker | 2nd |
| 16 |   |     |
| 17 |   |     |
| 18 | 6. Skill agricultural and fishery workers           | 2nd |
| 19 |   |     |
| 20 |   |     |
| 21 | 7. Craft and related workers                        | 2nd |
| 22 |   |     |
| 23 |   |     |
| 24 | 8. Plants and machine operators and assemblers      | 2nd |
| 25 |   |     |
| 26 |   |     |
| 27 | 9. Elementary occupations                           | 1st |
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| 30 | 10. Armed forces                                    | -   |
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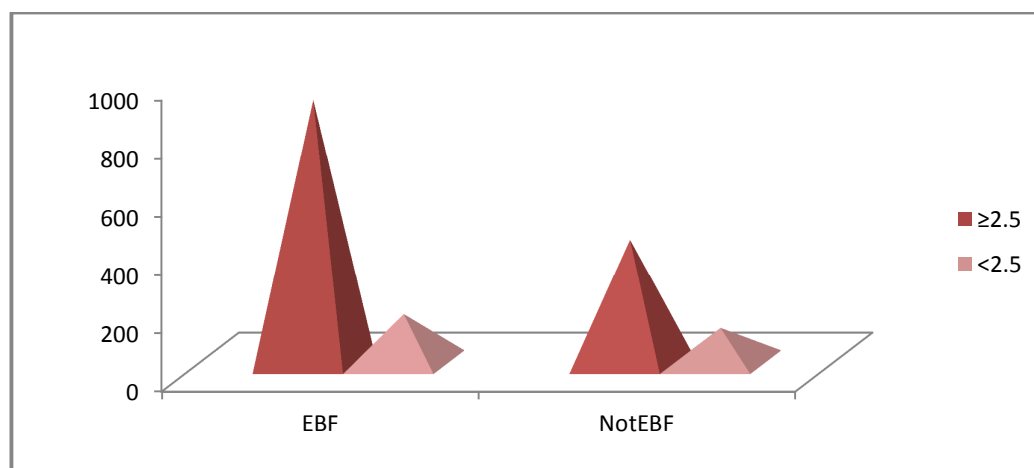


**Fig 1: Breast feeding and sex of the child**



**Fig 2: Breast feeding and postpartum depression**





**Fig 3: Breast feeding and birth weight**

**Article focus:**

We hypothesise that in a society with a pro-male bias there would be:

1. Higher Postnatal Depression score in mothers of girl babies.
2. Less breastfeeding of girl children.

**Key Message:**

1. Sex bias was evident in the low sex ratio at birth and the significantly lower ratio in families where first child was a girl.
2. Postnatal depression score were higher after birth of a girl child.
3. There was less exclusive breastfeeding of girl children.
4. Mothers with high postnatal depression score were less likely to breastfeed

**Strength of study:**

1. The postpartum depression was evaluated using a widely validated EPDS scoring system.

**Limitations of study:**

1. It was done in an urban hospital catering mostly to a middle class clientele. The findings on sex ratio may therefore not be generalisable to the other social groups.
2. We studied the initiation of exclusive breastfeeding in the first 48 hours. More studies are needed to elaborate the effect of sex bias on the duration of breastfeeding.
3. EPDS scoring was done in first 48 hrs and would include mothers with transient postpartum blues not amounting to postpartum depression. Follow up studies are needed to see that how many of them develop significant depression.
4. Although multiple regression analysis shows that higher depression score and female sex of child is associated with lower odds of exclusive breastfeeding, a causal relationship is not implied.
5. High rate of sex selective abortion may complicate the interpretation of results by family composition.

**Contributorship Statement:**

Akanksha Jain conceived the research project with Dr. Jacob Puliyeel.

Akanksha collected the data.

V.Sreenivasan helped with analysis of data and statistics

Prabhajeet Kaur and Prashant Tyagi helped with writeup and review of literature.

**Funding**

RCUK or Wellcome trust funded

**Competing Interests**

No competing interests

**Data Sharing Statement**

Original mastersheet containing anonymised patient data is available with the author and can be provided to anyone requesting the same.

**REFERENCES:**

1. American Academy of Paediatrics. Work Group on Breastfeeding. Breastfeeding and the Use of Human Milk. PEDIATRICS; 1997, Vol. 100 No. 6 pp. 1035-1039.
2. Huffman SL, Zehner ER, Victora C. Can improvements in breast-feeding practices reduce neonatal mortality in developing countries? Midwifery. 2001; 17:80-92.
3. Sheehan D, Bridle B, Hillier T, Feightner K, Hayward S, Breastfeeding outcomes of women following uncomplicated birth in Hamilton-Wentworth. *Can J Public Health* 1999; 90(6):408.
4. Anderson GC, Moore E, Hepworth J, Bergman N. Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database Syst Rev*. 2003;(2):CD003519
5. Unicef. Breastfeeding – The Remarkable First Hour Of Life. Malasia. Unicef 2007. [http://www.unicef.org/malaysia/Breastfeeding\\_First\\_Hour\\_of\\_Life.pdf](http://www.unicef.org/malaysia/Breastfeeding_First_Hour_of_Life.pdf) , Accessed on 27/6/12)
6. Unicef. Baby Friendly Hospital Initiative Revised, updated and expanded for integrated care. New York. World Health Organization and UNICEF 2009. [http://www.unicef.org/nutrition/files/BFHI\\_2009\\_s4.pdf](http://www.unicef.org/nutrition/files/BFHI_2009_s4.pdf) (Accessed 27/6/12)
7. McLearn KT, Minkovitz CS, Strobino DM, Marks E, Hou W. Maternal depressive symptoms at 2 to 4 months post partum and early parenting practices. *Arch Pediatr Adolesc Med*. 2006; 160:279-848.

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60
8. Ip S, Chung M, Raman G, Chew P, Magula N, DeVine D, Trikalinos T, Lau J. Breastfeeding and maternal and infant health outcomes in developed countries. *Evid Rep Technol Assess* . 2007 ;( 153):1-186.
  9. A-C Bernard-Bonnin; Canadian Paediatric Society, Mental Health and Developmental Disabilities Committee *Paediatr Child Health* 2004;9(8):575-83
  10. Melinda Smith, M.A., Jeanne Segal. Postpartum Depression and the Baby Blue; Symptoms, Treatment, and Support for New Moms. [www.helpguide.org/mental/postpartum\\_depression.htm](http://www.helpguide.org/mental/postpartum_depression.htm). (Accessed on 10/3/13)
  11. U. Ottawa. Postpartum depression [.www.med.uottawa.ca/sim/data/Depression\\_postpartum\\_e.htm](http://www.med.uottawa.ca/sim/data/Depression_postpartum_e.htm) (Accessed on 3/10/13)
  12. Murray D, Cox JL. Screening for depression during pregnancy with the Edinburgh Depression Scale (EPDS). *J Repro Infant Psychol* 1990: 8, 99-107
  13. Teissèdre F, Chabrol H. Detecting women at risk for postnatal depression using the Edinburgh Postnatal Depression Scale at 2 to 3 days postpartum. *Can J Psychiatry*. 2004 Jan; 49(1):51-419.
  14. Dennis CL, McQueen K. Does maternal postpartum depressive symptomatology influence infant feeding outcomes? *Acta Paediatr*. 2007; 96:590-4.
  15. Nayar U. Doomed before Birth: Study of Declining Sex Ratio in the Age Group 0-6 Years in Selected Districts of Punjab and Haryana. New Delhi : NCERT; Department of Women's Studies. 1995. pp. 287

- 1  
2  
3 16.Sahni M, Verma N, Narula D, Varghese RM, Sreenivas V, Puliye JM.  
4 Missing girls in India: infanticide, feticide and made-to-order  
5 pregnancies? Insights from hospital-based sex-ratio-at-birth over the last  
6 century. PLoS One. 2008 21;3:e2224.  
7  
8  
9  
10  
11 17. Manchanda S, Saikia B, Gupta N, Chowdhary S, Puliye JM. Sex ratio at  
12 birth in India, its relation to birth order, sex of previous children and use  
13 of indigenous medicine. PLoS One. 2011;6(6):e20097. Epub 2011 Jun 15.  
14  
15  
16 18.Jayachandran S, Kuziemko I. Why do mothers breastfeed girls less than  
17 boys? Evidence and implications for child health in India. Q J Econ. 2011;  
18 126:1485-1538.  
19  
20  
21 19. Currie ML, Rademacher R: *The pediatrician's role in recognizing and*  
22 *intervening in postpartum depression. Pediatr Clin North Am 2004;*  
23 *51:785–801.*  
24  
25  
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32  
33 20. Dubey C, Gupta N, Bhasin S, Muthal RA, Arora R . Prevalence and  
34 associated risk factors for postpartum depression in women attending a  
35 tertiary hospital, Delhi, India. Int J Soc Psychiatry. 2011 Aug 5.  
36  
37  
38 21. Nagpal J, Dhar RS, Sinha S, Bhargava V, Sachdeva A, Bhartia A. An  
39 exploratory study to evaluate the utility of an adapted Mother Generated  
40 Index (MGI) in assessment of postpartum quality of life in India. Health  
41 Qual Life Outcomes\_ 2008 Dec 2; 6:107.  
42  
43  
44  
45  
46  
47  
48 22. Warwick Institiue For Employment Research. Major Groups and Skill  
49 Levels ISCO 88 Guide Section 2;  
50 <http://www2.warwick.ac.uk/fac/soc/ier/research/links/isco88/english/s2/>,  
51  
52 (Accessed on 2/7/2012)  
53  
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2  
3 23. Confidence Interval Analysis (CIA) Software. Available at  
4 [www.som.soton.ac.uk/cia](http://www.som.soton.ac.uk/cia) . (Accessed on 10/4/12)  
5  
6  
7 24. Creative Research Systems. Sample size calculator. Available at  
8 <http://www.surveysystem.com/sscalc.htm#one>.( Accessed on 12/4/12)  
9  
10  
11 25. Sharma BR, Gupta N, Relhan N. Misuse of prenatal diagnostic technology  
12 for sex-selected abortions and its consequences in India. Public  
13 Health.2007 Nov;121(11):854-60.  
14  
15  
16 26. Jha P, Kumar R, Vasa P, Dhingra N, Thiruchelvam D, Moineddin R.Low  
17 female[corrected]-to-male [corrected] sex ratio of children born in India:  
18 national survey of 1.1 million households. Lancet. 2006 21;367:211-8.  
19  
20  
21 27. Kimani-Murage EW, Madise NJ, Fotso JC, Kyobutungi C, Mutua MK, Gitau  
22 TM, Yatich N. Patterns and determinants of breastfeeding and  
23 complementary feeding practices in urban informal settlements, Nairobi  
24 Kenya. BMC Public Health. 2011 26;11:396  
25  
26  
27 28. Adewuya AO, Fatoye FO, Ola BA, Ijaodola OR, Ibigbami  
28 SM.Sociodemographic and obstetric risk factors for postpartum  
29 depressive symptoms in Nigerian women. J Psychiatr Pract. 2005;  
30 11:353-8.  
31  
32  
33 29. Chandran M, Thayan P, Muliyl J, Abraham S. Post-partum depression in  
34 a cohort of women from a rural area of Tamil Nadu, India. Incidence and  
35 risk factors. Br J Psychiatry. 2002; 181:499-504  
36  
37  
38 30. Kheirabadi GR, Maracy MR, Barekataan M, Salehi M, Sadri GH, Kelishadi  
39 M, Cassy P. Risk factors of postpartum depression in rural areas of  
40 Isfahan Province, Iran. Arch Iran Med. 2009; 12:461-7.  
41  
42  
43 31. Yaron Y, Lehavi O, Orr-Urtreger A, Gull I, Lessing JB, Amit A, Ben-  
44 Yosef D. Maternal serum HCG is higher in the presence of a female  
45  
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3 fetus as early as week 3 post-fertilization. Hum Reprod. 2002 Feb;  
4  
5 17(2):485-9.  
6

7 32.Hendrick V, Altshuler LL, Suri R. Hormonal changes in the postpartum  
8  
9 and implications for postpartum depression. Psychosomatics. 1998 Mar-  
10  
11 Apr; 39(2):93-101.  
12

13 33.Dennis CL, McQueen K. The relationship between infant-feeding outcomes  
14  
15 and postpartum depression: a qualitative systematic review.Pediatrics.  
16  
17 2009; 123e736-51.  
18

19 34. Henderson JJ, Evans SF, Straton JA, Priest SR, Hagan R. Impact of  
20  
21 postnatal depression on breastfeeding duration. Birth. 2003 Sep;  
22  
23 30(3):175-80. Erratum in: Birth. 2004; 31:76.  
24  
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**ASSOCIATION OF BIRTH OF GIRLS, POSTPARTUM DEPRESSION  
AND EXCLUSIVE BREASTFEEDING – AN OBSERVATIONAL STUDY**

**Akanksha Jain, Prashant Tyagi, Praphjeet Kaur, Jacob Puliye, V.**

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**~~Study was guided by Dr Jacob Puliye.~~**

**ABSTRACT**

**OBJECTIVES AND HYPOTHESIS:** To examine influence of gender of baby on exclusive breastfeeding and incidence of postpartum depression (PPD). We hypothesize that in a society with a male gender bias there may be more PPD and less exclusive breastfeeding of girls.

**DESIGN:** Prospective study

**SETTING:** The study was conducted in an urban, tertiary hospital in Delhi.

**PARTICIPANTS:** Mothers delivering normally with their babies roomed-in. 1537 eligible women participated in the study.

**PRIMARY AND SECONDARY OUTCOME MEASURES:** Exclusive breastfeeding within first 48 hours of life and score on Edinburgh post partum depression scale (EPDS) were recorded.

**RESULTS:** 3,466 babies were born in the hospital. There were 792 girls for every 1000 boys. Among primiparous women, sex-ratio was 901 girls per 1000 boys. In second babies the sex-ratio was 737:1000. If the first child was a girl the birth ratio fell to 632. 1026 mothers were exclusively breastfeeding. Exclusive breast feeding of boys was significantly higher (70.8% vs 61.5%  $p < 0.001$ ). The EPDS score was significantly higher with birth of girls (EPDS  $6.0 \pm 3.39$  vs  $5.4 \pm 2.87$   $p < 0.01$ ). Women with EPDS  $> 11$  were less likely to exclusively breast feed ( $p < 0.01$ ).

**CONCLUSION:** The results point to a pro male gender bias evidenced by a low sex ratio at birth, higher EPDS score in mothers of girls and less breastfeeding of female children.

### **Article Summary**

- The postpartum depression was evaluated using a widely validated EPDS scoring system.
- It was done in an urban hospital catering mostly to a middle class clientele. The findings on sex ratio may therefore not be generalisable to the other social groups.
- We studied the initiation of exclusive breastfeeding in the first 48 hours. More studies are needed to elaborate the effect of sex bias on the duration of breastfeeding.
- EPDS scoring was done in first 48 hrs and would include mothers with transient postpartum blues not amounting to postpartum depression. Follow up studies are needed to see that how many of them develop significant depression.
- Although multiple regression analysis shows that higher depression score and female sex of child is associated with lower odds of exclusive breastfeeding, a causal relationship is not implied.
- High rate of sex selective abortion may complicate the interpretation of results by family composition.

## Reporting Checklist

| Section/Topic             | Item # | Recommendation   |
|---------------------------|--------|--|
| <b>Title and abstract</b> | 1      | (a) Indicate the study's design with a commonly used term in the title or the abstract   |
|                           |        | (b) Provide in the abstract an informative and balanced summary of what was done and what was found  |
| <b>Introduction</b>       |        |  |
| Background/rationale      | 2      | Explain the scientific background and rationale for the investigation being reported   |
| Objectives                | 3      | State specific objectives, including any pre-specified hypotheses  |
| <b>Methods</b>            |        |  |
| Study design              | 4      | Present key elements of study design early in the paper  |
| Setting                   | 5      | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection  |
| Participants              | 6      | (a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up<br><i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls<br><i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants |
|                           |        | (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed<br><i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case   |
| Variables                 | 7      | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable   |
| Data sources/measurement  | 8*     | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group   |
| Bias                      | 9      | Describe any efforts to address potential sources of bias  |
| Study size                | 10     | Explain how the study size was arrived at  |
| Quantitative variables    | 11     | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why   |
| Statistical               | 12     | (a) Describe all statistical methods, including those used to control for confounding  |

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| 6  | methods                  |      | (b) Describe any methods used to examine subgroups and interactions  |
| 7  |                          |      | (c) Explain how missing data were addressed  |
| 8  |                          |      | (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed  |
| 9  |                          |      | <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed   |
| 10 |                          |      | <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy   |
| 11 |                          |      | (e) Describe any sensitivity analyses  |
| 12 | <b>Results</b>           |      |  |
| 13 | Participants             | 13 * | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed            |
| 14 |                          |      | (b) Give reasons for non-participation at each stage   |
| 15 |                          |      | (c) Consider use of a flow diagram   |
| 16 | Descriptive data         | 14 * | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders   |
| 17 |                          |      | (b) Indicate number of participants with missing data for each variable of interest  |
| 18 |                          |      | (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)   |
| 19 | Outcome data             | 15 * | <i>Cohort study</i> —Report numbers of outcome events or summary measures over time  |
| 20 |                          |      | <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure   |
| 21 |                          |      | <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures   |
| 22 | Main results             | 16   | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included |
| 23 |                          |      | (b) Report category boundaries when continuous variables were categorized  |
| 24 |                          |      | (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period   |
| 25 | Other analyses           | 17   | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses   |
| 26 | <b>Discussion</b>        |      |  |
| 27 | Key results              | 18   | Summarise key results with reference to study objectives   |
| 28 | Limitations              | 19   | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias   |
| 29 | Interpretation           | 20   | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence                                   |
| 30 | Generalisability         | 21   | Discuss the generalisability (external validity) of the study results  |
| 31 | <b>Other information</b> |      |  |
| 32 | Funding                  | 22   | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based  |

The above reporting checklist is included in the article

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## **INTRODUCTION:**

Breast milk is the preferred food for all infants including premature and sick babies (1). UNICEF has promoted breastfeeding initiation within an hour of childbirth (2) (3). It provides nutritional, immunological, developmental and psychological advantages to the child besides health advantages to the mother and economic benefits to the family (1). It establishes skin-to-skin contact providing warmth to the newborn. Suckling at breast stimulates oxytocin release which further increasing flow of milk from breast. Breast milk reduces mortality in the first month of life (4). Early breast feed initiation is also associated with increased exclusive breastfeeding and longer duration of breastfeeding (5). The WHO and UNICEF launched the baby friendly hospital initiative in 1991 to strengthen maternity unit practices to support breastfeeding (6). However in spite of all these promotions and the known benefits of breastfeeding, exclusive breastfeeding and early initiation of breastfeeding are not often practiced. Factors intrinsic to the mother or baby may play a crucial role. One such factor is post partum depression (PPD) and there is evidence that mothers with PPD are less likely to breastfeed (7) (8).

Expression of postpartum depression may extend from the more transient baby blues to a longer lasting depression going on for several weeks (9). In both conditions there are mood swings, crying jags, sadness, insomnia and irritability. (10, 11)

The 10-question Edinburgh Postnatal Depression Scale (EPDS) is a validated, valuable and efficient way of identifying patients at risk for perinatal depression. It can be applied for depression screening during pregnancy. (12) The scale has been used as early as 1<sup>st</sup> or 2<sup>nd</sup> postpartum day in order to screen women at risk

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7 of PPD, by Teissedre F. In his study 1154 women completed EPDS at 2 to 3  
8 postpartum days and again at 4 to 6 weeks postpartum. He found that there was  
9 a highly significant positive correlation between EPDS scores on the two  
10 occasions (Spearman rank correlation:  $r = 0.59$ ,  $P < 0.0001$ ) (13). ~~Although~~  
11 ~~studies~~ ~~Although studies~~ done in the immediate postpartum period are likely to  
12 pick up many cases of postpartum blues, Dennis found that mothers with a EPDS  
13  $>12$  at 1 week postpartum were significantly more likely at 4 and/or 8 weeks to  
14 discontinue breastfeeding, be unsatisfied with their infant feeding method,  
15 experience significant breastfeeding problem and report lower levels of  
16 breastfeeding self-efficacy (14).  
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29 Studies looking at sex ratio at birth have shown that there is a strong gender  
30 bias in India, favouring boys (15) (16) (17). Jayachandran ~~and Kuziemko et al~~  
31 have shown that boys tend to be breast fed longer (18). The EPDS score in  
32 relation to sex of the child has not been studied. Also the ~~association~~  
33 ~~between~~ ~~association between~~ births of girl babies (in the society with a male sex  
34 bias), EPDS score soon after birth and exclusive breast feeding have not been  
35 examined previously. We hypothesize that there may be higher EPDS score and  
36 less exclusive early breast feeding of girl children. Recognition of these possible  
37 barriers to exclusive breast feeding may allow more focussed support to  
38 mothers that will promote breast feeding and improve survival of the girl baby.  
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48 **Ethics statement:** This study was approved by the St Stephen's Hospital  
49 Research Ethics Committee. Informed written consent was obtained from  
50 participants. The data and the names of the respondents are kept confidential.  
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52 The paper we propose to publish does not contain any identifying information, so  
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no response the patient made can be attributed to any of the participants in the study.

### **MATERIALS AND METHODS:**

This was an observational cross sectional -study conducted between August 2010 and July 2011, at St. Stephens Hospital, Delhi. Only mothers delivering normally with their babies roomed-in were invited to participate. Mothers who consented to participate were interviewed on each of the first 2 days after delivery to enquire about breast feeding. The weight of the baby, sex of the child, mother's education, history of previous births and socio-economic status were recorded.

Mothers were administered Edinburgh Post Partum Depression Scale (EPDS) on day 2(19). A Hindi translation of the EPDS was administered to mother who preferred Hindi (20). This translation has been back translated and validated previously (21). The outcomes measured were exclusive breastfeeding in first 48 hours and postpartum depression on EPDS.

The socioeconomic status was assigned grades 1 to 5 taking in to account the skill levels and formal education using the 'Major Groups and Skill Levels Classification' of University of Warwick ([Table 5](#)). ISCO-88 skill level 4 is considered grade 1 of socio-economic status, skill level 3 - grade 2, skill level 2 - grade 4, skill level 4 and those not working - grade 5 (22).

The education level was also graded as follows - grade 1: mothers who have not completed primary school education, grade 2: primary school graduates up to secondary school, grade 3: if they had passed up to higher secondary education,

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7 grade 4: college graduates and grade 5: mother who have completed a  
8 postgraduate degree course.  
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11 Correlates of exclusive breastfeeding were examined. The incidence of  
12 exclusive breastfeeding in boys and girls was examined separately and also for  
13 primi-parous mothers, separately from mothers who have had previous babies.  
14 EPDS score in relation to sex of the child was also examined. Depression score  
15 above 11 on EPDS was considered as significant using cut-off determined  
16 previously by Teissedre (13). Pearson chi square test was used to look for  
17 significance. Odds ratio and 95% CI of exclusive breastfeeding were calculated.  
18 For proportions; 95% CI of the observed proportion is reported. Multiple  
19 regression analysis of correlates of exclusive breastfeeding was also done. CI  
20 was calculated using CIA software (23).  
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30 **Sample size calculation:** We calculated that in order to get results that reflect  
31 the target population at the 95% confidence level with a margin of error of less  
32 than 2.5%, we would need to interview 1537 mothers (24).  
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**RESULTS:**

During the study period 3,466 babies were born at the hospital. There were only 792 girls for every 1000 boys. Among women delivering their first babies, there were 901 girls per 1000 boys. Among mothers delivering their second babies the sex ratio was 737 girls to 1000 boys. If first child was a girl the ratio in the second delivery fell to 632:1000 but if the first child was a boy the sex ratio in second children was 841:1000.

1537 mothers of singleton babies were enrolled in the study. The sex ratio in the study sample 797 girls per 1000 boys was similar to the sex ratio of overall deliveries. 1026 mothers in the study group were exclusively breastfeeding their babies.

Babies with birth weight 2.5 kg or heavier were more likely to be exclusively breast fed compared to those less than 2.5 kg (low birth weight) (68.2% vs 59.8%,  $p < 0.01$ ). Multiparous mothers were more likely to be exclusively breastfeeding than primiparous mothers (71.6% vs 62.8%, Difference = 0.089, 95% CI= 0.042 to 0.135).

Exclusive breast feeding was significantly more among mothers of boys as compared to those of girls (70.8 % vs 61.5 %  $p < 0.001$ ). Gender of baby had less influence on exclusive breastfeeding of first born children. 64.3% of primi boy babies and 61.0% of primi girl babies were exclusively breastfed ( $p = 0.32$ ).

If the first born was a girl and second baby was also a girl, 60% of second children were exclusively breastfed compared to 77.3%, if the second child was a boy ( $p = 0.05$ ). The chances of exclusively breastfeeding the baby was highest if there was a boy sibling in the family; 78.6% compared to 67.9%, if there was no boy ( $p < 0.01$ ).

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7 No significant difference in exclusive breastfeeding was found related to maternal  
8 age, socioeconomic status, maternal education, working status.  
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12 The EPDS score was significantly higher in mothers giving birth to a girl child  
13 (mean EPDS score  $6.0 \pm 3.39$  compared to  $5.4 \pm 2.87$ ,  $p < 0.01$ ). The  
14 depression score was significantly lower in mothers with at least one male child  
15 when compared to those with no male child ( $5.21 \pm 3.25$  vs  $5.9 \pm 3.2$ ,  $p < 0.01$ ).  
16 Significantly more mothers of girl babies had an EPDS score higher than 11  
17 compared to mothers of boys (9.7% vs 5.4%, difference in proportion = -0.045,  
18 CI = -0.072 to -0.019).  
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26 Higher EPDS score is associated with affects exclusive breastfeeding rates. Only  
27 52.4% mothers with score  $\geq 11$  were exclusively breastfeeding compared to 67.8  
28 % in those with score  $< 11$  ( $p < 0.01$ ).  
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36 Multiple logistic regression analysis indicated that birth of a female baby (OR =  
37 0.69, 95% CI: 0.56 to 0.87), high EPDS (OR = 0.53, 95% CI: 0.36 to 0.80) and  
38 low birth weight (OR = 0.72, 95% CI: 0.55 to 0.95) are associated with lower  
39 odds of exclusive breastfeeding. This analysis suggests that sex of the baby,  
40 EPDS score and birth weight are significant, independent factors influencing EBF.  
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## **DISCUSSION:**

Low female to male sex ratio is used as an index of the sex bias in the community and can result from antenatal sex screening and selective abortion of female babies (25). In India, male: female sex ratio is 914:1000. Sex ratio at birth is a better index of antenatal sex selection than the overall sex ratio (20).

Previous studies have shown that the sex ratio was particularly low in 2<sup>nd</sup> children if the first was a girl (17) (265).

The same phenomenon was seen again in the fresh cohort studied here. The sex ratio in 2<sup>nd</sup> order deliveries was 792 girls to 1000 boys but it was 632:1000 when 1<sup>st</sup> child was a girl child.

There was a male bias in breastfeeding too. More boys were being exclusively breastfed than girls. Jaychandran and Kuziemko hypothesise that since breastfeeding inhibits post-natal fertility, a mother might limit the nursing of an infant if she wants to continue having children. Mothers of girl children may want a boy soon and so may limit the duration of her feeding (18). Kimani et al also found sex of the child to be one of the factors for suboptimal breastfeeding in Kenya (n = 4299) (276).

### **Gender of baby and PPD**

Our study found that depression score was higher in mothers of girls. The influence of gender of baby on postpartum depression in mothers has been reported before. Adewuya et al in a study on Nigerian women found female sex of the baby was one of the predictors for PPD (OR 2.74, CI 1.87-4.03) (287). Chandran et al in Tamilnadu south India showed that birth of a daughter, when a son was desired, was ~~an important~~ important risk factors for depression (298). In

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7 a study of women in Iran also gender of the child was found to be an important  
8 factor contributing to PPD (2930). Mothers who conceive female fetus have  
9 higher level of beta hcg. This along with other similar hormonal changes may be  
10 a biological explanation for the child gender to affect PPD. (310) (324) However  
11 this has not been elucidated clearly as yet.  
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18 Our study of EPDS was done on the second day after delivery. The mothers with  
19 low EPDS score could be those with postpartum blues and not all of them will  
20 have persistent postpartum depression. Only follow up study will identify those  
21 with persistent postpartum depression. Our study protocol aimed at  
22 investigating early breastfeeding did not examine the issue of long lasting  
23 depression in mothers of girl children.  
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### 30 **PPD and Breast feeding**

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32 We found that mothers with higher EPDS score were less likely to be exclusively  
33 breastfeeding. The effects of PPD on exclusive breastfeeding have been reported  
34 earlier. Dennis also found that mothers with a EPDS >12 at 1 week postpartum  
35 were significantly more likely at 4 and/or 8 weeks to discontinue breastfeeding,  
36 be unsatisfied with their infant feeding method, experience significant  
37 breastfeeding problem and report lower levels of breastfeeding self-efficacy  
38 (332). In a cohort of 1745 Australian women it was found that median duration  
39 of breastfeeding was 26 weeks for women with early-onset depression, 28 weeks  
40 for women with late-onset depression, and 39 weeks for women without  
41 depression (343). Dennis and McQueen found maternal depression to be  
42 associated with delayed initiation (332) and Ip and colleagues found its  
43 association with early discontinuation (8) of breast feeding.  
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7 The birth of the girl child is associated with greater depression, and the lower  
8 exclusive breastfeeding in girls could be mediated by the depression. To examine  
9 the effect of depression on exclusive breastfeeding we studied exclusive  
10 breastfeeding in mothers of girls who had high EPDS score against those with  
11 low score. We found that in mothers of girls with higher depression score, only  
12 47.7% were exclusively breastfeeding compared to 63.0% with low depression  
13 levels (Difference in proportion= 0.154, 95% CI = -0.26 to -0.028). To look at  
14 the influence of sex of the child on exclusive breastfeeding independent of  
15 associated depression, we performed multiple logistic regression analysis which  
16 showed that female sex of the child was independently associated with lower  
17 odds of exclusive breastfeeding even after adjusting for depression. - The  
18 comparison between the female odds ratio on table1 (0.66) and the one on table  
19 4 (0.69) suggests that controlling for PPD and birth weight does not affect the  
20 gender difference in exclusive breastfeeding much.

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34 The results point to a pro male gender bias. Mothers of girls may need more  
35 help to overcome postpartum depression and for improving breastfeeding rates.  
36 This in turn could enhance the survival of girl children and improve the sex ratio  
37 in the country.

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42 This study does suffer from some shortcomings in as much as it was done in an  
43 urban hospital catering mostly to a middle class clientele. The findings on sex  
44 ratio may therefore not be generalisable to the other social groups. Studies in  
45 other populations are needed to confirm our findings.

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50 We studied exclusive breast feeding in the first 48 hours. More studies are  
51 needed to elaborate the effect of sex bias on the duration of breastfeeding.  
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7 We studied the EPDS in mothers within 48 hours of delivery. Many of those with  
8 high scores may be suffering from post partum blues rather than full fledged  
9 post partum depression. Further studies done later in the post natal period need  
10 to be done to examine how many of these mothers with high initial scores have  
11 longer lasting PPD.  
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17 Although multiple regression analysis shows that higher depression score and  
18 female sex of child is associated with lower odds of exclusive breastfeeding, a  
19 causal relationship is not implied.  
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24 In India the sex ratio is affected by antenatal sex determination and sex  
25 selective feticide (25). High rate of sex selective abortion may complicate the  
26 interpretation of results by family composition.  
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30 ~~Although multiple regression analysis shows that higher depression score~~  
31 ~~and female sex of child is associated with lower odds of exclusive breastfeeding,~~  
32 ~~a causal relationship is not implied.~~  
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50 **TABLE 1: Table showing correlates of Exclusive breast feeding and**  
51 **Postpartum depression**  
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| Characteristic                | EPDS<br>(Mean ± SD) | P       | Exclusive Breast Feeding |                   |         |                        |
|-------------------------------|---------------------|---------|--------------------------|-------------------|---------|------------------------|
|                               |                     |         | No<br>(N = 511)          | Yes<br>(N = 1026) | P       | Odds Ratio<br>(95% CI) |
| Maternal age (years)          |                     |         |                          |                   |         |                        |
| < 25                          | 5.8 ± 2.96          | 0.25    | 171 (36.4)               | 299 (63.6)        | 0.16    | 1.00                   |
| 25 – 29                       | 5.5 ± 3.17          |         | 237 (33.3)               | 474 (66.7)        |         | 1.14 (0.90 1.46)       |
| 30 – 34                       | 5.8 ± 3.35          |         | 84 (28.6)                | 210 (71.4)        |         | 1.43 (1.04 1.96)       |
| ≥ 35                          | 5.3 ± 2.71          |         | 19 (30.6)                | 43 (69.4)         |         | 1.20 (0.73 2.29)       |
| SES                           |                     |         |                          |                   |         |                        |
| Academic                      | 5.2 ± 3.12          | < 0.001 | 79 (32.4)                | 165 (67.6)        | 0.86    | 1.00                   |
| Vocational                    | 5.2 ± 2.87          |         | 109 (35.4)               | 199 (64.6)        |         | 0.87 (0.61 1.25)       |
| Short education               | 5.5 ± 3.07          |         | 130 (33.2)               | 261 (67.8)        |         | 0.96 (0.68 1.35)       |
| Skilled                       | 6.2 ± 3.18          |         | 147 (31.8)               | 315 (68.2)        |         | 1.03 (0.74 1.43)       |
| Semi/Unskilled                | 5.8 ± 3.42          |         | 45 (34.9)                | 84 (65.1)         |         | 0.89 (0.57 1.40)       |
| Birth weight (Kg)             |                     |         |                          |                   |         |                        |
| ≥ 2.5                         | 5.5 ± 3.18          | < 0.01  | 402 (31.7)               | 865 (68.3)        | < 0.01  | 1.00                   |
| < 2.5                         | 6.1 ± 2.98          |         | 108 (40.1)               | 161 (59.9)        |         | 0.69 (0.53 0.91)       |
| Maternal education            |                     |         |                          |                   |         |                        |
| < Primary                     | 6.8 ± 4.14          | < 0.01  | 23 (40.4)                | 34 (59.6)         | 0.44    | 1.00                   |
| Up to Secondary               | 6.0 ± 3.02          |         | 61 (33.3)                | 122 (66.7)        |         | 1.35 (0.73 2.49)       |
| Higher secondary              | 5.8 ± 2.93          |         | 111 (35.6)               | 201 (64.4)        |         | 1.22 (0.69 2.18)       |
| Graduate                      | 5.5 ± 3.03          |         | 226 (31.2)               | 499 (68.8)        |         | 1.49 (0.86 2.59)       |
| Post graduate                 | 5.3 ± 3.33          |         | 90 (34.7)                | 169 (65.3)        |         | 1.27 (0.71 2.29)       |
| Working status                |                     |         |                          |                   |         |                        |
| Yes                           | 4.9 ± 3.07          | < 0.001 | 87 (29.1)                | 212 (70.9)        | 0.09    | 1.00                   |
| No                            | 5.8 ± 3.11          |         | 423 (34.2)               | 813 (65.8)        |         | 0.79 (0.60 1.04)       |
| EPDS                          |                     |         |                          |                   |         |                        |
| < 11                          | -                   | -       | 460 (32.1)               | 972 (67.9)        | 0.001   | 1.00                   |
| ≥ 11                          |                     |         | 51 (48.6)                | 54 (51.4)         |         | 0.50 (0.34 0.75)       |
| Sex of the newborn            |                     |         |                          |                   |         |                        |
| Male                          | 5.4 ± 2.87          | < 0.001 | 249 (29.1)               | 606 (70.9)        | < 0.001 | 1.00                   |
| Female                        | 6.0 ± 3.39          |         | 262 (38.4)               | 420 (61.6)        |         | 0.66 (0.34 0.75)       |
| Sex of the newborn –<br>Primi |                     |         |                          |                   |         |                        |
| Male                          | 5.7 ± 2.68          | 0.87    | 163 (35.7)               | 294 (64.3)        | 0.32    | 1.00                   |
| Female                        | 5.6 ± 3.27          |         | 154 (39.0)               | 241 (61.0)        |         | 0.87 (0.66 1.15)       |
| No siblings                   |                     |         |                          |                   |         |                        |
| MM                            | 4.9 ± 3.49          | 0.06    | 317 (37.2)               | 535 (62.7)        | < 0.001 | 1.00                   |
| MF                            | 5.8 ± 3.4           |         | 17 (15.9)                | 90 (84.1)         |         | 3.1 (1.83 5.36)        |
| FM                            | 5.4 ± 3.59          |         | 17 (23.9)                | 54 (76.1)         |         | 1.9 (1.07 1.30)        |
| FF                            | 6.6 ± 3.39          |         | 24 (22.6)                | 82 (77.4)         |         | 2.0 (1.26 3.26)        |
| FF                            | 6.6 ± 3.39          |         | 14 (40.0)                | 21 (60.0)         |         | 0.89 (0.45 1.77)       |
| >2 children                   | 5.8 ± 3.14          |         | 122 (33.3)               | 244 (66.7)        |         | 1.2 (0.92 1.53)        |

M = male, F = female, MM = 2<sup>nd</sup> male child, FF = 2<sup>nd</sup> female child, FM = male child after a female child

**Table 2: Birth order 2 or more**

| Characteristic | EPDS (Mean | P | No EBF | EBF | P | Odds Ratio |
|----------------|------------|---|--------|-----|---|------------|
|----------------|------------|---|--------|-----|---|------------|

|             | $\pm$ SD)       |       |               |               |       | (95% CI)            |
|-------------|-----------------|-------|---------------|---------------|-------|---------------------|
| Male sib    | 5.21 $\pm$ 3.52 |       | 52<br>(26.8)  | 191<br>(38.9) |       | 1.00                |
| No Male sib | 5.9 $\pm$ 3.2   | <0.01 | 142<br>(73.2) | 300<br>(61.1) | <0.01 | 0.58<br>(0.40-0.83) |

**Table 3: Breastfeeding by EPPDS and sex of child**

| Characteristic | EBF in males       | EBF in females     | P     |
|----------------|--------------------|--------------------|-------|
| EPDS <11       | 583/815<br>(71.5%) | 389/617<br>(63.0%) | 0.001 |
| EPDS $\geq$ 11 | 23/40<br>(57.5%)   | 31/65<br>(47.7%)   | 0.33  |

**Table 4: Multiple Logistic Regression Analysis**

| bf        | Odds Ratio | Std. Err. | z     | P> z  | [95% Conf. Interval] |
|-----------|------------|-----------|-------|-------|----------------------|
| sex       | .6900392   | .0761006  | -3.36 | 0.001 | .5559035 .8565409    |
| high_epds | .5326528   | .1094171  | -3.07 | 0.002 | .3561157 .7967046    |
| low_bwt   | .719286    | .1005456  | -2.36 | 0.018 | .5469104 .9459912    |

**Table 5: Edinburgh Postnatal Depression Scale****INSTRUCTIONS FOR USERS**

- ~~1. The mother is asked to underline the response that comes closest to how she has been feeling in the previous 7 days.~~
- ~~2. All 10 items must be completed.~~
- ~~3. Care should be taken to avoid the possibility of the mother discussing her answers with others.~~

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~~4. The mother should complete the scale herself, unless she has limited English or has difficulty with reading.~~

~~5. The Edinburgh Postnatal Depression Scale may be used at 6–8 weeks to screen postnatal women. The child health clinic, a postnatal checkup, or a home visit may provide a suitable opportunity for its completion.~~

~~Edinburgh Postnatal Depression Scale~~

~~Name:~~

~~Address:~~

~~Baby's age:~~

~~Because you have recently had a baby, we would like to know how you are feeling. Please underline the answer that comes closest to how you have felt in the past 7 days, not just how you feel today.~~

~~Here is an example, already completed:~~

- ~~– I have felt happy:~~
- ~~– Yes, all the time~~
- ~~– Yes, most of the time~~
- ~~– No, not very often~~
- ~~– No, not at all~~

~~This would mean: "I have felt happy most of the time" during the past week. Please complete the other questions in the same way.~~

~~In the past 7 days:~~

- ~~– 1. I have been able to laugh and see the funny side of things~~
- ~~– As much as I always could~~
- ~~– Not quite so much now~~
- ~~– Definitely not so much now~~
- ~~– Not at all~~
- ~~– 2. I have looked forward with enjoyment to things~~
- ~~– As much as I ever did~~
- ~~– Rather less than I used to~~
- ~~– Definitely less than I used to~~
- ~~– Hardly at all~~
- ~~– \*3. I have blamed myself unnecessarily when things went wrong~~
- ~~– Yes, most of the time~~
- ~~– Yes, some of the time~~
- ~~– Not very often~~

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- No, never
  - ~~4.-~~ I have been anxious or worried for no good reason
  - No, not at all
  - Hardly ever
  - Yes, sometimes
  - Yes, very often
  - ~~\*5.-~~ I have felt scared or panicky for no very good reason
  - Yes, quite a lot
  - Yes, sometimes
  - No, not much
  - No, not at all
  - ~~\*6.-~~ Things have been getting on top of me
  - Yes, most of the time I haven't been able to cope at all
  - Yes, sometimes I haven't been coping as well as usual
  - No, most of the time I have coped quite well
  - No, I have been coping as well as ever
  - ~~\*7.-~~ I have been so unhappy that I have had difficulty sleeping
  - Yes, most of the time
  - Yes, sometimes
  - Not very often
  - No, not at all
  - ~~\*8.-~~ I have felt sad or miserable
  - Yes, most of the time
  - Yes, quite often
  - Not very often
  - No, not at all
  - ~~\*9.-~~ I have been so unhappy that I have been crying
  - Yes, most of the time
  - Yes, quite often
  - Only occasionally
  - No, never
  - ~~\*10.-~~ The thought of harming myself has occurred to me
  - Yes, quite often
  - Sometimes

- Hardly ever
- Never

Response categories are scored 0, 1, 2, and 3 according to increased severity of the symptom. Items marked with an asterisk (\*) are reverse scored (i.e., 3, 2, 1, and 0). The total score is calculated by adding the scores for each of the 10 items.

(34) (Permitted for general use)

**Table 56: ISCO-88 major groups and skill level**

| Major group   | ISCO skill levels |
|---|-------------------|
| 1. Legislators, senior officials and managers       | -                 |
| 2. Professionals                                    | 4th               |
| 3. Technicians and associate professionals          | 3rd               |
| 4. Clerks   | 2nd               |
| 5. Service workers and shop and market sales worker | 2nd               |
| 6. Skill agricultural and fishery workers           | 2nd               |
| 7. Craft and related workers                        | 2nd               |
| 8. Plants and machine operators and assemblers      | 2nd               |
| 9. Elementary occupations                           | 1st               |
| 10. Armed forces                                    | -                 |

(22)

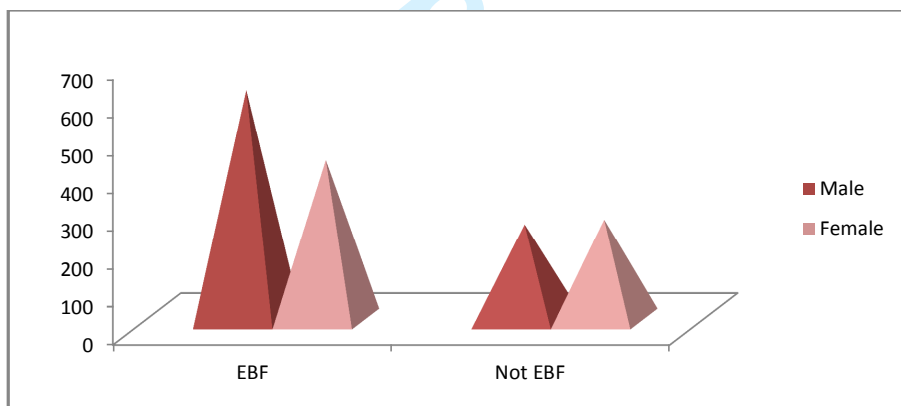


Fig 1: Breast feeding and sex of the child

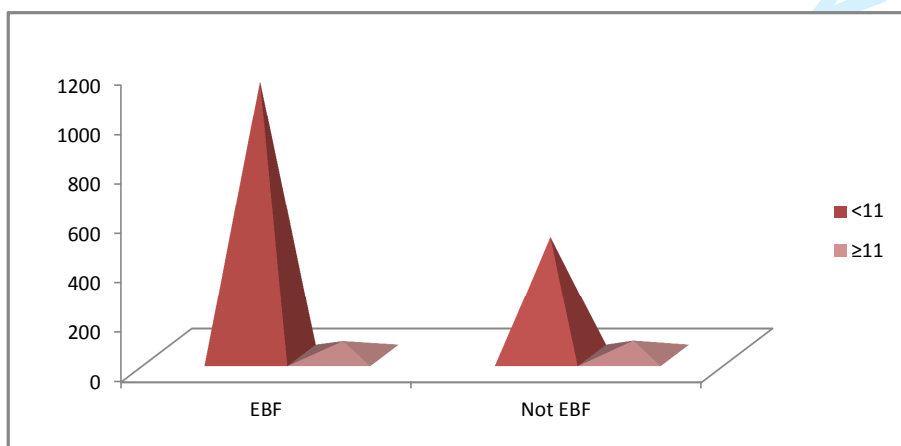
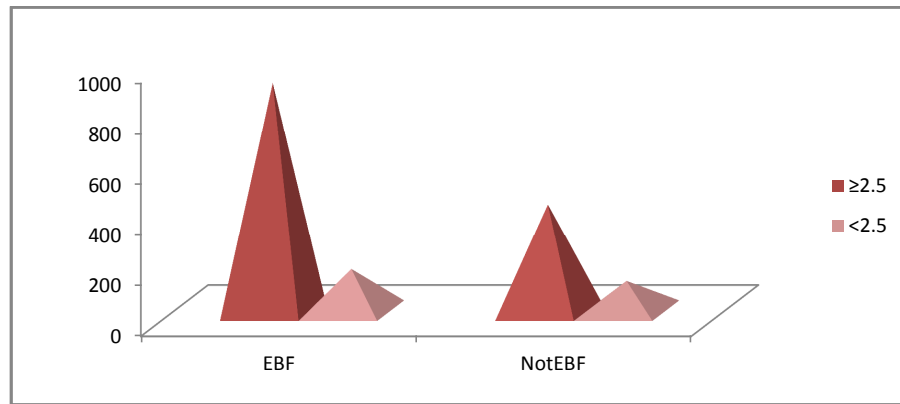


Fig 2: Breast feeding and postpartum depression

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**Fig 3: Breast feeding and birth weight**

#### Article focus:

We hypothesise that in a society with a pro-male bias there would be:

1. Higher Postnatal Depression score in mothers of girl babies.
2. Less breastfeeding of girl children.

#### Key Message:

1. Sex bias was evident in the low sex ratio at birth and the significantly lower ratio in families where first child was a girl.
2. Postnatal depression score were higher after birth of a girl child.
3. There was less exclusive breastfeeding of girl children.
4. Mothers with high postnatal depression score were less likely to breastfeed

**Strength of study:**

1. The postpartum depression was evaluated using a widely validated EPDS scoring system.

**Limitations of study:**

1. It was done in an urban hospital catering mostly to a middle class clientele. The findings on sex ratio may therefore not be generalisable to the other social groups.

2. We studied the initiation of exclusive breastfeeding in the first 48 hours. More studies are needed to elaborate the effect of sex bias on the duration of breastfeeding.

3. EPDS scoring was done in first 48 hrs and would include mothers with transient postpartum blues not amounting to postpartum depression. Follow up studies are needed to see that how many of them develop significant depression.

4. Although multiple regression analysis shows that higher depression score and female sex of child is associated with lower odds of exclusive breastfeeding, a causal relationship is not implied.

5. High rate of sex selective abortion may complicate the interpretation of results by family composition.

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**REFERENCES:**

1. American Academy of Paediatrics. Work Group on Breastfeeding. Breastfeeding and the Use of Human Milk. PEDIATRICS; 1997, Vol. 100 No. 6 pp. 1035-1039.
2. Huffman SL, Zehner ER, Victora C. Can improvements in breast-feeding practices reduce neonatal mortality in developing countries? Midwifery. 2001; 17:80-92.
3. Sheehan D, Bridle B, Hillier T, Feightner K, Hayward S, Lee KS, Krueger P, Sword W, James M. Breastfeeding outcomes of women following uncomplicated birth in Hamilton-Wentworth. *Can J Public Health* 1999; 90(6):408.

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7 4. Anderson GC, Moore E, Hepworth J, Bergman N. Early skin-to-skin  
8 contact for mothers and their healthy newborn infants\_ Cochrane  
9 Database Syst Rev. 2003;(2):CD003519
- 10  
11 5. Unicef. Breastfeeding – The Remarkable First Hour Of Life. Malasia. Unicef  
12 2007. [http://www.unicef.org/malaysia](http://www.unicef.org/malaysia/Breastfeeding_First_Hour_of_Life.pdf)  
13 [/Breastfeeding\\_First\\_Hour\\_of\\_Life.pdf](http://www.unicef.org/malaysia/Breastfeeding_First_Hour_of_Life.pdf) , Accessed on 27/6/12)
- 14  
15 6. Unicef. Baby Friendly Hospital Initiative Revised, updated and expanded  
16 for integrated care. New York. World Health Organization and UNICEF  
17 2009. [http://www.unicef.org/nutrition/files/BFHI\\_2009\\_s4.pdf](http://www.unicef.org/nutrition/files/BFHI_2009_s4.pdf) (Accessed  
18 27/6/12)
- 19  
20 7. McLearn KT, Minkovitz CS, Strobino DM, Marks E, Hou W. Maternal  
21 depressive symptoms at 2 to 4 months post partum and early parenting  
22 practices. Arch Pediatr Adolesc Med. 2006; 160:279-848.
- 23  
24 8. Ip S, Chung M, Raman G, Chew P, Magula N, DeVine D, Trikalinos T, Lau  
25 J. Breastfeeding and maternal and infant health outcomes in developed  
26 countries. Evid Rep Technol Assess . 2007 ;( 153):1-186.
- 27  
28 9. A-C Bernard-Bonnin; Canadian Paediatric Society, Mental Health and  
29 Developmental Disabilities Committee Paediatr Child Health  
30 2004;9(8):575-83
- 31  
32 10. Melinda Smith, M.A., Jeanne Segal. Postpartum Depression and the Baby  
33 Blue; Symptoms, Treatment, and Support for New Moms.  
34 [www.helpguide.org/mental/postpartum\\_depression.htm](http://www.helpguide.org/mental/postpartum_depression.htm). (Accessed on  
35 10/3/13)
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7 11.U. Ottawa. Postpartum depression  
8 [.www.med.uottawa.ca/sim/data/Depression\\_postpartum\\_e.htm](http://www.med.uottawa.ca/sim/data/Depression_postpartum_e.htm)  
9 (Accessed on 3/10/13)  
10  
11  
12 12. Murray D, Cox JL. Screening for depression during pregnancy with the  
13 Edinburgh Depression Scale (EPDS). *J Repro Infant Psychol* 1990; 8, 99-  
14 107  
15  
16  
17 13. Teissèdre F, Chabrol H. Detecting women at risk for postnatal depression  
18 using the Edinburgh Postnatal Depression Scale at 2 to 3 days  
19 postpartum. *Can J Psychiatry*. 2004 Jan; 49(1):51-419.  
20  
21  
22 14. Dennis CL, McQueen K. Does maternal postpartum depressive  
23 symptomatology influence infant feeding outcomes? *Acta Paediatr*. 2007;  
24 96:590-4.  
25  
26  
27  
28 15. Nayar U. Doomed before Birth: Study of Declining Sex Ratio in the Age  
29 Group 0-6 Years in Selected Districts of Punjab and Haryana. New Delhi :  
30 NCERT; Department of Women's Studies. 1995. pp. 287  
31  
32  
33 16. Sahni M, Verma N, Narula D, Varghese RM, Sreenivas V, Puliye JM.  
34 Missing girls in India: infanticide, feticide and made-to-order  
35 pregnancies? Insights from hospital-based sex-ratio-at-birth over the last  
36 century. *PLoS One*. 2008 21;3:e2224.  
37  
38  
39 17. Manchanda S, Saikia B, Gupta N, Chowdhary S, Puliye JM. Sex ratio at  
40 birth in India, its relation to birth order, sex of previous children and use  
41 of indigenous medicine. *PLoS One*. 2011;6(6):e20097. Epub 2011 Jun 15.  
42  
43  
44 18. Jayachandran S, Kuziemko I. Why do mothers breastfeed girls less than  
45 boys? Evidence and implications for child health in India. *Q J Econ*. 2011;  
46 126:1485-1538.  
47  
48  
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7 19. Currie ML, Rademacher R: The pediatrician's role in recognizing and  
8 intervening in postpartum depression. *Pediatr Clin North Am* 2004;  
9 51:785-801.

10  
11  
12 ~~19. Hewitt C, Gilbody S, Brealey S, Paulden M, Palmer S, Mann R,~~  
13 ~~Green J, Morrell J, Barkham M, Light K, Richards D. Methods to identify~~  
14 ~~postnatal depression in primary care: an integrated evidence synthesis~~  
15 ~~and value of information analysis. *Health Technol Assess*. 2009; 13:1-~~  
16 ~~145, 147-230.~~

17  
18  
19  
20  
21 20. Dubey C, Gupta N, Bhasin S, Muthal RA, Arora R . Prevalence and  
22 associated risk factors for postpartum depression in women attending a  
23 tertiary hospital, Delhi, India. *Int J Soc Psychiatry*. 2011 Aug 5.

24  
25  
26  
27 21. Nagpal J, Dhar RS, Sinha S, Bhargava V, Sachdeva A, Bhartia A. An  
28 exploratory study to evaluate the utility of an adapted Mother Generated  
29 Index (MGI) in assessment of postpartum quality of life in India. *Health*  
30 *Qual Life Outcomes*. 2008 Dec 2; 6:107.

31  
32  
33  
34 22. Warwick Institute For Employment Research. Major Groups and Skill  
35 Levels ISCO 88 Guide Section 2;  
36 <http://www2.warwick.ac.uk/fac/soc/ier/research/links/isco88/english/s2/>,  
37  
38 (Accessed on 2/7/2012)

39  
40  
41  
42 23. Confidence Interval Analysis (CIA) Software. Available at  
43 [www.som.soton.ac.uk/cia](http://www.som.soton.ac.uk/cia) . (Accessed on 10/4/12)

44  
45  
46 24. Creative Research Systems. Sample size calculator. Available at  
47 <http://www.surveysystem.com/sscalc.htm#one>. (Accessed on 12/4/12)

48  
49 25. Sharma BR, Gupta N, Relhan N. Misuse of prenatal diagnostic technology  
50 for sex-selected abortions and its consequences in India. *Public*  
51 *Health*.2007 Nov;121(11):854-60.

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7 | 25-26. Jha P, Kumar R, Vasa P, Dhingra N, Thiruchelvam D, Moineddin  
8 | R.Low female[corrected]-to-male [corrected] sex ratio of children born in  
9 | India: national survey of 1.1 million households. *Lancet*. 2006  
10 | 21;367:211-8.  
11  
12  
13 | 26-27. Kimani-Murage EW, Madise NJ, Fotso JC, Kyobutungi C, Mutua MK,  
14 | Gitau TM, Yatich N. Patterns and determinants of breastfeeding and  
15 | complementary feeding practices in urban informal settlements, Nairobi  
16 | Kenya. *BMC Public Health*. 2011 26;11:396  
17  
18  
19 | 27-28. Adewuya AO, Fatoye FO, Ola BA, Ijaodola OR, Ibigbami  
20 | SM.Sociodemographic and obstetric risk factors for postpartum  
21 | depressive symptoms in Nigerian women. *J Psychiatr Pract*. 2005;  
22 | 11:353-8.  
23  
24  
25 | 28-29. Chandran M, Thayan P, Muliyl J, Abraham S. Post-partum  
26 | depression in a cohort of women from a rural area of Tamil Nadu, India.  
27 | Incidence and risk factors. *Br J Psychiatry*. 2002; 181:499-504  
28  
29  
30 | 29-30. Kheirabadi GR, Maracy MR, Barekatin M, Salehi M, Sadri GH,  
31 | Kelishadi M, Cassy P. Risk factors of postpartum depression in rural areas  
32 | of Isfahan Province, Iran. *Arch Iran Med*. 2009; 12:461-7.  
33  
34  
35 | 30-31. Yaron Y, Lehavi O, Orr-Urtreger A, Gull I, Lessing JB, Amit A,  
36 | Ben-Yosef D. Maternal serum HCG is higher in the presence of a  
37 | female fetus as early as week 3 post-fertilization. *Hum Reprod*. 2002 Feb;  
38 | 17(2):485-9.  
39  
40  
41 | 31-32. Hendrick V, Altshuler LL, Suri R. Hormonal changes in the  
42 | postpartum and implications for postpartum depression. *Psychosomatics*.  
43 | 1998 Mar-Apr; 39(2):93-101.  
44  
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7 | ~~32-33.~~ Dennis CL, McQueen K. The relationship between infant-feeding  
8 outcomes and postpartum depression: a qualitative systematic  
9 review. *Pediatrics*. 2009; 123e736-51.  
10

11 | ~~33-34.~~ Henderson JJ, Evans SF, Straton JA, Priest SR, Hagan R. Impact of  
12 postnatal depression on breastfeeding duration. *Birth*. 2003 Sep;  
13 30(3):175-80. Erratum in: *Birth*. 2004; 31:76.  
14  
15

16  
17 | ~~34. Currie ML, Rademacher R: The pediatrician's role in recognizing and~~  
18 ~~intervening in postpartum depression. *Pediatr Clin North Am* 2004;~~  
19 ~~51:785-801.~~  
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## Reporting Checklist

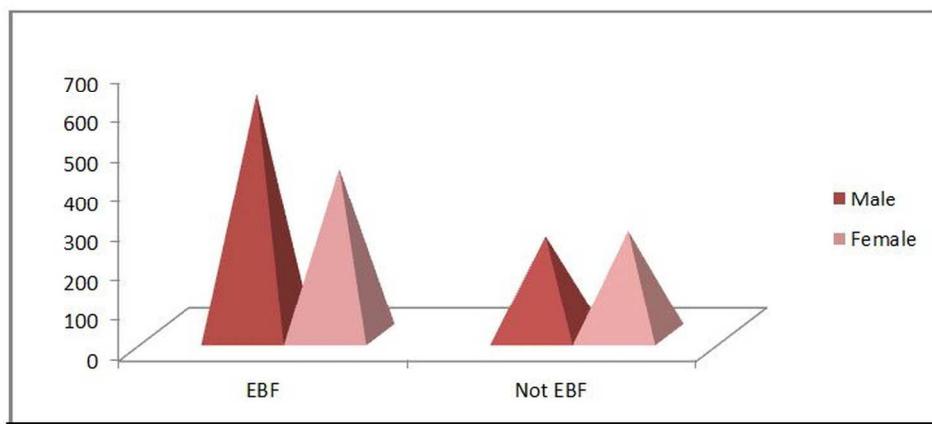
| Section/Topic             | Item # | Recommendation   |
|---------------------------|--------|--|
| <b>Title and abstract</b> | 1      | (a) Indicate the study's design with a commonly used term in the title or the abstract   |
|                           |        | (b) Provide in the abstract an informative and balanced summary of what was done and what was found  |
| <b>Introduction</b>       |        |  |
| Background/rationale      | 2      | Explain the scientific background and rationale for the investigation being reported   |
| Objectives                | 3      | State specific objectives, including any pre-specified hypotheses  |
| <b>Methods</b>            |        |  |
| Study design              | 4      | Present key elements of study design early in the paper  |
| Setting                   | 5      | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection  |
| Participants              | 6      | (a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up<br><br><i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls<br><br><i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants |
|                           |        | (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed<br><br><i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case   |
| Variables                 | 7      | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable   |
| Data sources/measurement  | 8*     | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group   |
| Bias                      | 9      | Describe any efforts to address potential sources of bias  |

|                        |         |   |
|------------------------|---------|---|
| Study size             | 10      | Explain how the study size was arrived at   |
| Quantitative variables | 11      | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why  |
| Statistical methods    | 12      | (a) Describe all statistical methods, including those used to control for confounding   |
|                        |         | (b) Describe any methods used to examine subgroups and interactions   |
|                        |         | (c) Explain how missing data were addressed   |
|                        |         | (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed<br><i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed<br><i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy |
|                        |         | (e) Describe any sensitivity analyses   |
| <b>Results</b>         |         |   |
| Participants           | 13<br>* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed   |
|                        |         | (b) Give reasons for non-participation at each stage  |
|                        |         | (c) Consider use of a flow diagram  |
| Descriptive data       | 14<br>* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders  |
|                        |         | (b) Indicate number of participants with missing data for each variable of interest   |
|                        |         | (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)  |
| Outcome data           | 15<br>* | <i>Cohort study</i> —Report numbers of outcome events or summary measures over time   |
|                        |         | <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure  |
|                        |         | <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures  |
| Main results           | 16      | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included  |



|                          |    |  |
|--------------------------|----|--|
|                          |    | (b) Report category boundaries when continuous variables were categorized  |
|                          |    | (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period   |
| Other analyses           | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses   |
| <b>Discussion</b>        |    |  |
| Key results              | 18 | Summarise key results with reference to study objectives   |
| Limitations              | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias                 |
| Interpretation           | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence |
| Generalisability         | 21 | Discuss the generalisability (external validity) of the study results  |
| <b>Other information</b> |    |  |
| Funding                  | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based              |

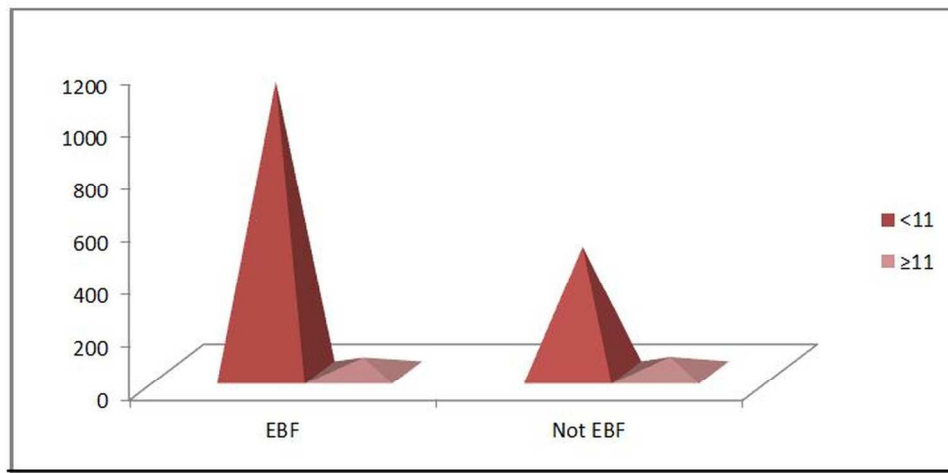
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**Fig 1: Breast feeding and sex of the child**

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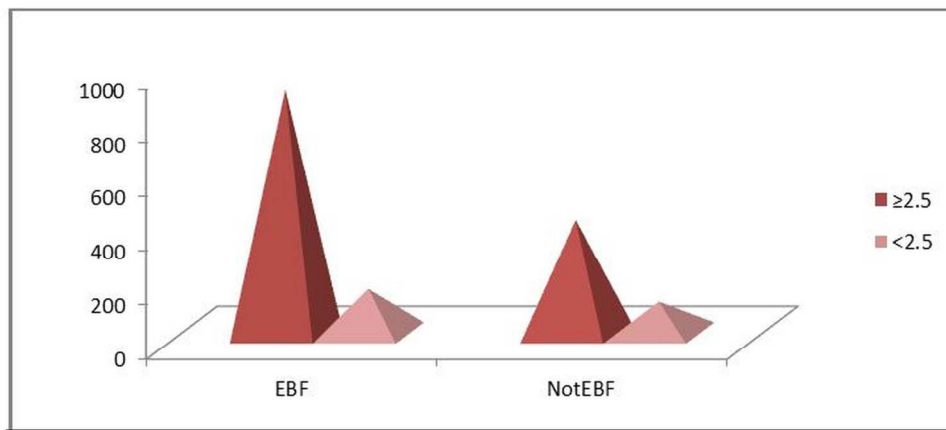
**Fig 2: Breast feeding and postpartum depression**

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**Fig 3: Breast feeding and birth weight**

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