

# BMJ Open Determinants of depressive symptoms among postpartum mothers: a cross-sectional study in Ethiopia

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## ABSTRACT

**Objective** This study aims to assess the determinants of depressive symptoms among postpartum mothers.

**Design** A community-based cross-sectional study was conducted.

**Setting** Ten randomly selected rural *kebeles* of Meket district of Ethiopia.

**Participants** A random sample of 232 mothers with infants 5–10 months was included in this study.

**Data analysis** Forward multivariable logistic regression analysis.

**Results** The factors significantly associated with increased odds of maternal postpartum depressive symptoms were: moderate (adjusted OR (AOR) 4.44, 95% CI 1.34 to 14.72) and severe (AOR 12.98, 95% CI 5.24 to 32.14) household food insecurity; infant underweight (AOR 2.99, 95% CI: 1.21 to 7.37) and infant acute respiratory infection (ARI) (AOR 7.0, 95% CI: 3.09 to 15.99). Maternal education, workload and age, household socioeconomic status, distance to the health facility, and child stunting, diarrhoea and fever were not significantly associated with postpartum depressive symptoms in adjusted logistic regression.

**Conclusion** Household food insecurity, infant ARI and infant underweight had significant associations with postpartum depressive symptoms. Therefore, interventions that address infant nutrition and health and household food insecurity within the framework of the productive safety net programmes (PSNPs) as well as programmes focused on preventing, detecting and solving maternal mental health challenges may be helpful to improve maternal mental well-being and promote graduation from the PSNP.

Maternal mental health remains a public health problem worldwide, affecting 18.4% of mothers during the postpartum period.<sup>1</sup> Maternal postpartum depression (PPD) is a psychological disorder defined as an affective mood disorder that occurs a few days after birth and persists up to 1 year.<sup>2</sup> The burden of maternal depression, particularly PPD, is higher in low/middle-income countries (LMICs) compared with the developed countries.<sup>3–5</sup> Among the 322 million people suffering from various forms of depression worldwide, about 29.9 million are living in Africa.<sup>6</sup> Despite the high burden of mental

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This is a community-based study to assess the determinants of postpartum depressive symptoms of mothers from a productive safety net programme-implementing district of Ethiopia.
- ⇒ A unique aspect of the present study is that it comprehensively captured issues of infant, maternal and household characteristics, mothers' workload and maternal depression.
- ⇒ Due to the cross-sectional nature of the study, causal inferences cannot be made; hence, findings are presented as associations.
- ⇒ The depressive symptoms data were assessed based on maternal recall of the 7 days prior to the survey and may reflect under-reporting or over-reporting.
- ⇒ The present study findings came from a single district and thus cannot be extrapolated to all districts of northern Ethiopia.

health challenges in Africa, there is a large problem of identification, diagnosis and timely treatment, particularly in resource-constrained settings, leading to a huge gap between the need for and the provision of mental health services.<sup>7</sup>

## BACKGROUND

Evidence from LMICs has documented an association between PPD and impaired child growth,<sup>8 9</sup> poor breast feeding and complementary feeding practices,<sup>10–12</sup> increased diarrhoeal episodes and infectious illnesses.<sup>13</sup> The high prevalence of PPD and its associated risks for poor child health outcomes, growth and suboptimal complementary feeding practices suggest that integrating interventions that address PPD in productive safety net programmes (PSNPs) and infant and young child feeding programmes, as well as investigations of the factors that influence maternal mental well-being, are needed.

Several studies have reported various determinants of PPD such as low economic status, poor marital relationships, poor maternal



educational status, poor child health, extended family structure, lack of postpartum confinement practices, low family function and neurotic personality in other countries.<sup>14–17</sup> In Ethiopia specifically, a study has reported the prevalence of PPD to be 23.3% in women in Addis Ababa.<sup>18</sup> Nevertheless, limited studies have assessed the determinants of PPD in Ethiopia particularly in food-insecure areas. To inform policy, evidence on whether the determinants mentioned above are similar in Ethiopia is needed because of broader sociocultural issues, including potential differences in access to social support mechanisms or social networks within communities and between countries for women during the postpartum period. Therefore, this study assessed determinants and the prevalence of depressive symptoms among postpartum mothers in food-insecure areas of northern Ethiopia.

## METHODS AND MATERIALS

### Study design and setting

A community-based cross-sectional study was conducted in rural areas of northern Ethiopia from 1 March to 30 April 2018. The region had a high prevalence of stunting (46%) in under 5 children. The study area is characterised by a rocky landscape with inhabited mountains reaching from 1000 to 3600 m above sea level.

### The study population, sample size and sampling procedures

The study participants were 232 mother–infant (5–10 months old) pairs who had participated in an earlier study on maternal depression and child undernutrition.<sup>4</sup> All were PSNP beneficiaries. Study participants were selected using multistage sampling techniques. Of the 27 *kebeles* (the lowest administrative unit in Ethiopia) in the district, 10 were randomly selected. A listing of PSNP4 households with infants 5–10 months of age and who had lived at least 6 months in the selected *kebeles* was completed from the database that was compiled by the research team including local healthcare workers prior to actual data collection. The number of mother–child pairs to be selected was proportionally allocated to 10 *kebeles* based on the total number of the households with children aged 5–10 months old in each *kebele*. The study participants were then selected by systematic random sampling from the sampling frame.

### Data collection

Sociodemographic data were collected using pretested interviewer-administered questionnaires. Infant illnesses were reported by the mother for the 2 weeks prior to data collection. The infant illnesses assessed were: (a) acute respiratory infections (ARIs) defined as cough with associated difficulty breathing; (b) diarrhoea, defined as three or more loose or fluid stools per day; and (c) fever.

The Household Food Insecurity Access Scale was used to assess household food insecurity<sup>19</sup> during the 4 weeks preceding the survey. Based on their scores, households

were categorised as: food secure, mildly food insecure, moderately food insecure and severely food insecure.

Infant length was measured to the nearest 0.1 cm using a portable wooden recumbent length board with a fixed head and sliding foot piece, and weight was measured with an electronic scale (UNICEF Seca 770) with light clothing to the nearest 0.01 kg. Anthropometric status was calculated as length-for-age z-score, weight-for-length z-score and weight-for-age z-score.

Maternal depression was assessed using the Edinburgh Postnatal Depression Scale (EPDS).<sup>20</sup> Scores  $\geq 13$  were used to classify mothers as depressed, and these results have been published.<sup>4</sup> The EPDS has been validated in Ethiopian mothers<sup>21</sup> and also used for another study in Ethiopia.<sup>22</sup> The EPDS has also been used to assess PPD in several other sub-Saharan African countries<sup>23 24</sup> and has shown wide utility as a screening scale for maternal depression.

### Data processing and analysis

Data were coded and entered into SPSS V.20 by the principal investigator. Categorical data are presented by descriptive statistics (frequency and percentage); whereas range, mean and SD are used to present continuous variables.

Wealth index was computed using principal component analysis as a composite indicator of living standard based on ownership of selected household assets, size of agricultural land, number of livestock, materials used for housing construction, ownership of improved water and sanitation facilities and household possessions (radio, television, mobile phone, table). Initially, 21 variables were considered for the analysis. During analysis, four variables (use of electricity service, ownership of improved water and sanitation facilities and size of agricultural land) were dropped as their communality scores were less than 50%. Ultimately, six principal components having eigen values greater than one were identified. The components explained 70.6% of the total variance which was above the recommended minimum value of 60%. Wealth index values were calculated by summing up the scores for the six components. Ultimately, the three categories (low, medium and high) were generated by splitting the wealth index values into three equal classes.

The  $\chi^2$  test was used to assess the associations of maternal and household characteristics and infant anthropometric status with maternal depression. When significant associations were found, crude ORs (CORs) were computed to determine the strength of bivariate association. Forward multivariable logistic regression analysis was used to determine the most important determinants of maternal depression. Statistical significance was set at  $p < 0.05$ .

### Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

## RESULTS

### Sociodemographic characteristics of study participants

The age range of participants (mothers) was 16–49 years with a mean ( $\pm$ SD) age of 28.1 $\pm$ 6.6 years. About half of the households were in the middle wealth category for this area. Most of the study participants were housewives, and over half (59%) of the mothers had no formal education. More than one-third of households had >5 members. More than half of the households were food secure, whereas 28% were severely food insecure. During the 2 weeks before the survey, diarrhoea (29.7%), ARI (24.1%) and fever (40.1%) were reported for many infants.

PPD (defined as EPDS scores  $\geq$ 13) associations with maternal and household characteristics are presented in [table 1](#). Bivariate analysis was conducted to identify the strength of the association between maternal depression and each characteristic. Among the maternal characteristics associated with depressive symptoms were maternal workload and walking distance to the health facility. Depressive symptoms were 2.33 times higher in mothers who had been involved in heavy workload than mothers with low workload in the 1 week preceding the survey (COR 2.33, 95% CI 1.15 to 4.74). Odds of depressive symptoms in mothers who walked a distance longer than

**Table 1** Results of bivariate analysis between maternal and household characteristics and depressive symptoms of postpartum mothers in Ethiopia (n=232)

Characteristics	Depressive symptoms		P value*	OR (95% CI)
	No n (%)	Yes n (%)		
Socioeconomic status				
Lower†	52 (68.4)	24 (31.6)	0.04	
Middle	95 (81.2)	22 (18.8)		0.50 (0.25 to 0.98)
Upper	32 (82.1)	7 (17.9)		0.47 (0.18 to 1.22)
Family size				
<4†	36 (75.0)	12 (25.0)	0.78	
4–5	80 (76.2)	25 (23.8)		0.84 (0.38 to 1.85)
>5	63 (79.7)	16 (20.3)		0.75 (0.36 to 1.53)
Age of the mothers (years)				
16–24†	48 (71.6)	19 (28.4)	0.44	
25–34	90 (78.9)	24 (21.1)		0.67 (0.33 to 1.52)
35–49	41 (80.4)	10 (19.6)		0.61 (0.25 to 1.47)
Level of household food security				
Food secure†	110 (92.4)	9 (7.6)	<0.001	
Mildly food insecure	19 (90.5)	2 (9.5)		1.28 (0.25 to 6.42)
Moderately food insecure	20 (74.1)	7 (25.9)		4.27 (1.42 to 12.80)
Severely food insecure	30 (46.2)	35 (53.8)		14.25 (6.17 to 32.91)
Maternal workload				
Low†	81 (82.7)	17 (17.3)	0.04	
Medium	47 (81.0)	11 (19.0)		1.11 (0.48 to 2.48)
Heavy	25 (32.9)	51 (67.1)		2.33 (1.15 to 4.74)
Walking distance from nearby health facility				
Less than 30 min†	115 (82.1)	25 (17.9)	0.026	
Longer than 30 min	28 (30.4)	64 (69.6)		2.01 (1.08 to 3.74)
Maternal occupation				
Housewives	149 (77.2)	44 (22.8)	0.97	
Working†	30 (76.9)	9 (23.1)		0.98 (0.43 to 2.22)
Maternal educational status				
Educated	78 (82.1)	17 (19.9)	0.13	
Not educated†	101 (73.7)	36 (26.3)		1.63 (0.85 to 3.12)

\* $\chi^2$  test.

†Reference group.

**Table 2** Results of bivariable analysis of associations between infants' characteristics and postpartum depressive symptoms in Ethiopia (n=232)

Characteristics	Depressive symptoms		P value*	OR (95% CI)
	No n (%)	Yes n (%)		
Infant sex				
Male†	105 (75.5)	34 (24.5)	0.47	
Female	74 (79.6)	19 (20.4)		0.79 (0.42 to 1.49)
Infant illness in last 2 weeks				
Diarrhoea				
No†	132 (81.0)	31 (19.0)	0.035	
Yes	47 (68.1)	22 (31.9)		1.99 (1.05 to 3.77)
ARI				
No†	152 (86.4)	24 (13.6)	<0.001	
Yes	27 (48.2)	29 (51.8)		6.80 (3.45 to 13.40)
Fever				
No†	118 (84.9)	21 (15.1)	0.001	
Yes	61 (65.6)	32 (34.4)		2.94 (1.56 to 5.54)
Infant anthropometric status				
LAZ				
Not stunted†	132 (82.0)	29 (18.0)	0.01	
Stunted	24 (33.8)	47 (62.2)		2.32 (1.23 to 4.38)
WAZ				
Not underweight†	149 (81.0)	35 (19.0)	0.007	
Underweight	18 (37.5)	30 (62.5)		2.55 (1.28 to 5.09)

\*X<sup>2</sup> test.  
†Reference group.  
ARI, acute respiratory infection; LAZ, length-for-age z-score; WAZ, weight-for-age z-score.

30 min to the health facility were two times higher than in mothers who walked a distance less than 30 min (COR 2.01, 95% CI 1.08 to 3.74).

Among the household characteristics, socioeconomic status and food insecurity were associated with maternal depressive symptoms. Mothers from middle socioeconomic status households (COR 0.50, 95% CI 0.25 to 0.98) were 50% less likely to be depressed than those from low socioeconomic status households. Postpartum depressive symptoms were 4.27 and 14.25 times higher in moderately (COR 4.27, 95% CI 1.42 to 12.80) or severely (COR 14.25, 95% CI 6.17 to 32.91) food-insecure households, respectively, than for mothers from food-secure households.

Infant illnesses (diarrhoea, fever and ARI), stunting and underweight were significantly associated with increased odds of maternal depressive symptoms (table 2). Mothers whose infants suffered from diarrhoea had about two times greater odds of depressive symptoms than mothers of healthy infants (COR 1.99, 95% CI 1.05 to 3.77). Similarly, mothers whose infants suffered from ARI and fever had more than six times (COR 6.80, 95% CI 3.45 to 13.40) and about three times (COR 2.99, 95% CI 1.56 to 5.54) higher odds of depressive symptoms, respectively, than mothers of infants who were well. Again, infant stunting and underweight were associated

with higher odds of depressive symptoms. Mothers of stunted infants had 2.3 times higher odds of suffering from postpartum depressive symptoms than mothers of non-stunted infants (COR 2.32, 95% CI 1.23 to 4.38). Moreover, mothers of underweight infants had 2.5 times increased odds of depressive symptoms compared with mothers of infants who were not underweight (COR 2.55, 95% CI 1.28 to 5.09).

In forward multivariable logistic regression conducted to identify most important determinants of maternal depression symptoms, only three factors were significantly associated with higher odds of depressive symptoms (table 3). Maternal depressive symptoms were about 4 and 13 times higher in moderately (adjusted OR (AOR) 4.44, 95% CI 1.34 to 14.72) and severely (AOR 12.98, 95% CI 5.24 to 32.14) food-insecure households, respectively, compared with food-secure households. Mothers whose infants suffered from ARI during the 2 weeks prior to the survey were seven times more likely to be depressed than mothers of healthy infants (AOR 7.0, 95% CI 3.09 to 15.99). Moreover, mothers having underweight infants were 2.99 times more likely to be depressed than mothers of infants not classified as underweight (AOR 2.99, 95% CI 1.21 to 7.37).



**Table 3** Multivariable logistic regression model predicting depressive symptoms of postpartum mothers in Ethiopia (n=232)

Variables	AOR* (95% CI)	P value
Level of household food security		
Food secure†		
Mildly food insecure	0.96 (0.17 to 5.3)	0.96
Moderately food insecure	4.44 (1.34 to 14.72)	0.015*
Severely food insecure	12.98 (5.24 to 32.14)	<0.001**
Infant illness		
ARI		
No†		
Yes	7.0 (3.09 to 15.99)	<0.001**
Infant anthropometric status		
Not underweight (WAZ >−2 SD)		
Underweight (WAZ ≤−2 SD)	2.99 (1.21 to 7.37)	0.017*

\*Statistically significant at p<0.05; \*\*statistically significant at p<0.001.  
 \*AOR (adjusted for maternal education, workload and mother age, socioeconomic status, distance to the health facility, child LAZ, diarrhoea and fever).  
 †Reference group.  
 .AOR, adjusted OR; ARI, acute respiratory infection; LAZ, length-for-age z-score; WAZ, weight-for-age z-score.

## DISCUSSION

In the current study, we found a significant association between several infant, maternal and household characteristics and depressive symptoms in bivariate analysis. However, most of these associations were no longer significant in forward logistic regression analysis. Several studies both from developing countries<sup>25 26</sup> and a developed country<sup>27</sup> found associations between socioeconomic status and depression. However, one review study from sub-Saharan Africa did not find such an association, and the authors suggested that social hardship is endemic across sub-Saharan Africa and as a result may not be a contributing factor to postnatal depression within this population.<sup>28</sup> The variations observed in terms of factors associated with maternal depression may be cultural differences across sub-Saharan African countries.<sup>29</sup> The study settings and types of depression screening scales used may also contribute to the differences. In Ethiopia, shared childcaring practices within husband's and wife's families and neighbourhoods are common and may have diluted the association between maternal PPD symptoms and socioeconomic factors in this study.<sup>30</sup> Children in many communities in Ethiopia are also considered as potential future capital, giving higher parity mothers an elevated social rank compared with mothers of the same age with a smaller number of children.

The present study found a significant bivariate association between heavy workload and maternal depression. Depressive symptoms were higher in mothers who had participated in laborious activities in the 7 days preceding the survey. Similarly, one study from the USA found increased maternal workload associated with poor mental health and increased symptoms of depression.<sup>31</sup> Possible

contributing factors might be laborious activities at home as well as lack of time for rest, recovery and sleep. Maternal empowerment programmes and increasing support from household members could relieve maternal burdens and in turn improve maternal mental health. The issue warrants further investigation, however, because the association with workload did not remain significant in the adjusted model.

Household food insecurity was identified as a strong predictor of maternal depression after adjusting for other covariates in multivariable analysis. This finding is in agreement with findings from Bangladesh.<sup>25</sup> Thus, attempts to improve household food security through poverty reduction such as PSNPs, village economic and social associations (VESAs) and other programmes aimed at improving household income and food security might be necessary to improve maternal mental well-being.

Furthermore, statistically significant associations were found between infant underweight and maternal depression in the adjusted model. Similar evidence has been reported from Malawi and Pakistan.<sup>32 33</sup> Although our univariate comparisons between depressive symptoms of mothers whose infants had various illnesses (diarrhoea, fever, ARI) were significant, only ARI showed a strong association with maternal depressive symptoms after controlling for other confounding factors in multivariable analysis. Nguyen and colleagues<sup>11</sup> likewise reported a strong association between maternal depression and child ARI; furthermore, authors of a study from Chile recommended that mothers of children with high risk of persistent diarrhoea be offered psychological support programmes.<sup>34</sup> However, findings from elsewhere in Ethiopia and in Bangladesh<sup>25 35</sup> did not detect such associations. Reasons for differences among studies may include seasonality and duration of data collection, social desirability of having a healthy infant and sociocultural differences in childcare practices.

Although a cross-sectional study design limits the ability to draw conclusions about direction of relationships between maternal depression and common infant illnesses, possible mechanisms by which infant illnesses may affect maternal depression include the caring responsibilities for a sick child (eg, administration of oral rehydration solution, repeated washing of clothes soiled by infant diarrhoea and vomiting and seeking healthcare for a sick child). The emotional impact of having a sick child also might be a contributing factor for maternal depressive symptoms.

There were some limitations in the present study. The associations determined do not reflect causal relationships. Also, the depressive symptoms data were assessed based on maternal recall of the 7 days prior to the survey and may reflect under-reporting or over-reporting of depressive symptoms. Similarly, we assessed infant illnesses based on maternal report and there might be recall and social desirability biases.

## CONCLUSION

We found that household food insecurity, and infant ARI and underweight were the strongest determinants of PPD in the study area. These findings suggest that strengthening poverty reduction programmes and household income-generation activities, like social protection (PSNP) as well as VESAs, might enhance maternal mental well-being by improving household food insecurity. Moreover, the association between maternal depression and infant illness could indicate the need to encourage utilisation of healthcare facilities when children are ill in order to promote maternal mental health. Maternal mental health issues in maternal and child healthcare programmes can be promoted through health extension packages and other programmes developed to address the sustainable development goals. Furthermore, because this study was conducted in a PSNP woreda where a majority of the households were PSNP beneficiaries, the findings underline the importance of identifying ways that help to prevent, detect and solve maternal mental health challenges within the framework of PSNPs in order to improve household food security and lead to graduation from the programme.

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**Contributors** AA was involved in conceptualising the study, reviewing the literature, designing the protocol, developing the questionnaire, data collection, statistical analysis, and preparing the manuscript BS was involved in interpretation of data and critically reviewing the manuscript. AA, BS and KB worked in conceptualising the study and critically reviewed the manuscript. All authors read and approved the final manuscript.

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**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not required.

**Ethics approval** This study involves human participants and ethical clearance was obtained from Hawassa University Institutional Review Board (ref. no. IRB/178/10). The purpose of the study was explained in a formal letter to district administration. Prior to enrolment in the study, informed written consent was obtained from mothers.

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**Data availability statement** Data are available upon reasonable request.

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