

RESEARCH NOTE

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# Maternal depression does not affect complementary feeding indicators or stunting status of young children (6–23 months) in Northern Ghana

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## Abstract

**Objective:** Maternal depression may affect child feeding practice which is an important determinant of child nutritional status. The objective of this study was to explore the association between maternal depression and WHO complementary feeding indicators [minimum dietary diversity (MDD), minimum meal frequency (MMF) and minimum acceptable diet (MAD)] or stunting status of children (6–23 months) in Tamale Metropolis, Ghana. A community-based cross-sectional study was carried out involving 200 mother–child pairs randomly sampled from three communities in Tamale Metropolis, Ghana.

**Results:** The prevalence of MDD, MMF, and MAD were 56.5, 65.0, and 44.0% respectively and 41.0% of the children sampled were stunted. A third of the mothers (33.5%) screened positive for depression. Maternal depression did not influence significantly MDD ( $p = 0.245$ ), MMF ( $p = 0.442$ ), and MAD ( $p = 0.885$ ) or children's risk of stunting ( $p = 0.872$ ). In conclusion maternal depression and child stunting are prevalent in Northern Ghana but there is a lack of evidence of an association between maternal depression and child feeding practices or nutritional status in this study population. Further research is needed to assess the effect of maternal depression on feeding practices and growth of young children.

**Keywords:** Stunting, Malnutrition, Complementary feeding indicators, Maternal depression, Northern Ghana

## Introduction

About a third of children under five are chronically malnourished in Northern Region, Ghana [1]. Inadequate dietary intake and repeated infections are the two immediate causes of undernutrition but underlying these are a number of determinants including child care [2]. Child care is a complex set of behaviours including child feeding practices [3, 4]. Complementary feeding is the process of introducing foods and liquids to infants when breast milk alone is no longer sufficient to meet their nutritional requirements. The World Health Organisation (WHO) recommends three indicators for assessing

the appropriateness of complementary feeding of children (6–23 months) namely minimum meal frequency (MMF), minimum dietary diversity (MDD) and minimum acceptable diet (MAD) [5]. Children receive MMF if they are fed complementary foods the minimum recommended number of times in relation to their age and breastfeeding status. Children receive MDD if they are fed complementary foods from 4 out of 7 food groups. Children who receive both MMF and MDD are said to receive MAD. In 2014, only 21.3% of children under five received MAD in the Northern Region, while 33.3 and 48.4% received MMF and MDD respectively [6].

Maternal depression can negatively affect women's reproductive roles [7] and although the exact mechanism is not known, it may affect child outcomes postnatally by interfering with mother–child bond and/or provision of

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child care [8, 9]. Maternal depression has been linked to poor child feeding practices [10] and undernutrition in children in developing countries [11–16].

Children aged 6–23 months are particularly vulnerable to malnutrition because the required amounts of energy and nutrients needed to support their rapid growth may not be provided. Given the high prevalence of child malnutrition in Northern Ghana, research is needed to identify new risk factors in order to inform programme design. Research linking maternal depression and complementary feeding practices or malnutrition in children in Ghana is scanty. We evaluated the association between maternal depression and WHO complementary feeding indicators or nutritional status of children (6–23 months) in Tamale Metropolis, Northern Ghana.

## **Main text**

### **Methods**

#### ***Study design, setting and participants***

A population-based cross-sectional study was conducted in a cluster of three communities, Chanshegu, Guunaa yili, and Kabonaa yili, in Tamale Metropolis, Northern Ghana between January and March, 2016. These communities share boundaries and have common socio-cultural characteristics. Prior to the study, a survey was conducted in the study communities to register all children aged 6–23 months and their mothers ( $n=239$ ). Using simple random sampling, 200 mother–child pairs were sampled from the 239 registered for the study.

#### ***Data collection***

Data were collected on socio-demographic characteristics and depression status of mothers, and nutritional status of children using questionnaires. The questionnaires were in Dagbani, the local language spoken in the study area. The enumerators were three students of the Department of Nutritional Sciences, UDS.

#### ***Assessment of complementary feeding indicators***

The complementary feeding indicators MDD, MMF and MAD were estimated using data from 24-h recall [17]. In the 24-h dietary recall, the mothers of the children were asked to recall the foods the children ate in the last 24 h prior to the interview. Based on this, the number of food groups children ate from was indicated. Seven standard food groups namely: grains, roots and tubers; legumes and nuts; dairy products; flesh foods; eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables were used [17]. A child who received foods from  $\geq 4$  out of the 7 standard food groups during the previous day was classified to have received MDD. A child who was fed at least the recommended number of meals in the last 24 h was classified to have received MMF. A child

who received both MDD and MMF was classified to have received MAD.

#### ***Anthropometry***

Anthropometric measurements were performed following standard procedure [18]. Recumbent length was measured using infantometers and the ages of the children were determined from their dates of birth and the dates of the survey. WHO Anthro was used to compute height-for-age z-scores [19]. Height-for-age z-score is derived by comparing the height of the study children to the height of children of the same age and sex (as the study children) in the WHO Child Growth Standards. Children were classified as stunted if they had height-for-age z-scores less than  $-2$  standard deviations. Stunting is a chronic form of malnutrition manifested as short stature.

#### ***Assessment of depression***

Maternal depression status was determined using Centre for Epidemiologic Studies–Depression (CES-D) scale [20]. CES-D scale comprised of 20 items and asks caregivers to rate how often over the past week they experienced depression-associated symptoms [20]. Each item has four responses. The responses for items 4, 8, 12, and 16 are scored 3, 2, 1 and 0 respectively while the responses for all other items are reverse scored. The total CES-D score is obtained by summing up the scores for the 20 items. A cut-off of  $\geq 20$  [21] was used to classify the mothers as depressed.

#### ***Statistical analysis***

Data were analyzed using Stata (version 13). Descriptive statistics were computed, frequencies and percentages for categorical variables, and means and standard deviations for continuous variables. Pearson Chi square (or Fisher's exact) test was used to compare the socio-demographic characteristics of the mothers with and without depression. Logistic regression analysis was used to estimate the odds of receiving MMF, MDD, and MAD by children of depressed mothers compared to children of non-depressed mothers. Similarly, the risk of stunting in children of depressed mothers compared to children of non-depressed mothers was estimated. In all statistical tests, a  $p$  value  $< 0.05$  was considered statistically significant.

#### ***Ethics***

Ethical clearance (Protocol Number 26-2015) was obtained for the study from the Joint Ethical Review Committee of School of Medicine and Health Sciences and School of Allied Health Sciences, University for Development Studies, Tamale, Ghana. Also, informed

consent was obtained from the subjects before they were enrolled into the study.

## Results

The mothers' age ranged from 18 to 41 years with a mean of 27.0 ( $\pm 5.1$ ) years and most (45.5%) were in the 26–30 years age group (Table 1). The majority of the mothers had no education (58.0%), and were traders (69.0%); a greater majority belonged to Dagomba ethnic group (88.5%), practised Islamic religion (97.0%) and were married (94.5%).

The ages of the children ranged from 6 to 23 months with a mean of 13.4 ( $\pm 5.3$ ) months, and most were in the 12–23 months age group (59.0%), and were females (57.0%) (Table 1). The mean weight and height of the children were 8.9 ( $\pm 2.4$ ) kg, and 71.5 ( $\pm 6.5$ ) cm respectively. About 40% of the children had stunting (41.0%) and stunting prevalence rate was higher for older children (12–23 months) than younger ones (6–11 months) and for males than females (Table 2). With respect to the indicators of complementary feeding, 56.5, 65.0 and 44.0% of the children received MDD, MMF and MAD.

About a third of the mothers (33.5%) screened positive for depression. There were no significant differences in the distribution of the socio-demographic characteristics of the mothers with and without depression (data not shown) (Additional file 1).

The likelihood of obtaining MMF, MDD and MAD by children of depressed mothers was determined by comparing them to children of non-depressed mothers. Children of mothers with and without depression had similar likelihoods of receiving the three indicators of complementary feeding—MMF [crude odds ratio (COR): 1.28, 95% confidence interval (CI) 0.68–2.39], MDD (COR: 0.70, 95% CI 0.39–1.27) and MAD (COR: 0.96, 95% CI 0.53–1.73) (Table 3). Similarly, children belonging to mothers with and without depression had comparable risks of stunting (Table 3).

## Discussion

We explored the role of child feeding practices in mediating the effects of maternal depression on the growth of young children. We found similar rates of WHO complementary feeding indicators and undernutrition among children of mothers with and without depression, suggesting maternal depression does not affect child feeding practices and nutritional status in this study population. To our knowledge this is the first study to link maternal depression to WHO complementary feeding indicators.

The percentage of stunted children was higher than the average for Northern Region (33.1%) [1]. This may reflect the exposure of these children to sub-optimal breastfeeding and complementary feeding practices and repeated

**Table 1 Socio-demographic characteristics of mothers and children**

Characteristic	Frequency (n = 200)	Percent
Mothers		
Age group (years)		
< 20	8	4.0
20–24	50	25.0
25–29	89	44.5
30–34	38	19.0
35+	15	7.5
Highest educational level completed		
No education	116	58.0
Primary	19	9.5
Junior High School/Middle school	39	19.5
Senior High School/Vocational school	17	8.5
University	9	4.5
Marital status		
Married	189	94.5
Single, never married	10	5.0
Divorced/separated/widowed	1	0.5
Religion		
Islamic	194	97.0
Christian	6	3.0
Occupation		
Trader	138	69.0
Farmer	18	9.0
Teacher	6	3.0
Others	38	19.0
Ethnicity		
Dagomba	177	88.5
Gonja	10	5.0
Mamprusi	9	4.5
Others	4	2.0
Children		
Age group (month)		
6–11	82	41.0
12–23	118	59.0
Sex		
Male	86	43.0
Female	114	57.0

infections [22, 23]. Stunting which reflects accumulation of exposure to sub-optimal feeding practices and repeated infections was more frequent in older children than younger ones and in males than females as reported in other studies also [24–26]. The possible reasons for this finding include increased morbidity rate in early infancy [27–29], and greater biologically programmed growth trajectory for male infants which causes higher demands for most nutrients that may not be met [30].

**Table 2 Mean height-for-age z-score and prevalence of stunting in children 6–23 months, by age and sex**

Height-for-age z-score	Number	Mean	SD	Prevalence of stunting (%)
Age group (months)				
6–11	82	−1.46	1.53	36.9
12–23	118	−1.82	1.35	44.1
Sex				
Male	86	−2.08	1.35	51.2
Female	114	−1.36	1.42	33.3
All	200	−1.67	1.43	41.0

A high percentage of the children (65.0%) received MME, 56.0% received MDD and less than half (44%) received MAD. These figures are higher than the regional averages [6] probably because most mothers were engaged in foodstuff petty trade. In most cases, children are fed the required number of times with less dietary diversity or vice versa and the result in each case is a diet inadequate to meet the nutritional requirements of children and predisposes them to malnutrition [2].

Interestingly, we obtained higher prevalence rates for both complementary feeding indicators and stunting compared to figures for Northern Region. Given the higher prevalences of MME, MDD, and MAD observed in our study, one would have expected a lower rate of stunting but this was not the case reflecting a lack of association between complementary feeding indicators and child nutritional status, a finding also reported by another study [31]. An alternative explanation is the unavailability of other important determinants of child nutritional status such as preventive health services.

This reinforces the fact that child nutritional status is a product of food and non-food factors, both of which must be available for proper growth and development of children.

A higher prevalence of maternal depression was estimated (33.5%) than previously reported for a population of mothers in Ghana (3.8–27.8%) [11, 13, 32–36]. Among these studies the highest rate (27.8%) was reported for mothers in Northern Ghana [11] while lower rates were reported for southern Ghana (3.8–11.3%). This reflects the high socio-economic disparity between southern and northern Ghana [37] and the correlation between depression and low socio-economic status [38, 39].

Maternal depression can affect child feeding practices and nutritional status of young children.

Our study does not agree with two studies that reported negative effect of depression on breastfeeding [12, 40]. Some studies link maternal depression and undernutrition in children [11, 14–16] but a similar study like ours does not [41]. The possible reasons for the lack of associations between maternal depression and complementary feeding indicators or child nutritional status in our study population include the nonexistence of these associations in the study population, a lack of sufficient power by our study to detect these associations if they exist or the sharing of child care resources by families. Child care support is known to lessen the impact of maternal mental illness on child growth indicators [42]. In most Ghanaian families in rural areas, all adults in the household contribute to child care and this may have happened in the study area to ensure a mother's depression status does not influence the feeding or nutritional status of her children.

**Table 3 Comparing complementary feeding indicators and nutritional status of children of mothers with and without depression**

Characteristic	Children of non-depressed mothers (%), n = 133	Children of depressed mothers (%), n = 67	Depression status of mother	Odds ratio (95% CI)	p value
Minimum meal frequency					
No	36.8	31.3	Non-depressed	1.00	0.442
Yes	63.2	68.7	Depressed	1.28 (0.68–2.39)	
Minimum dietary diversity					
No	40.6	49.3	Non-depressed	1.00	0.245
Yes	59.4	50.7	Depressed	0.70 (0.39–1.27)	
Minimum acceptable diet					
No	55.6	56.7	Non-depressed	1.00	0.885
Yes	44.4	43.3	Depressed	0.96 (0.53–1.73)	
Stunting					
No	59.4	58.2	Non-depressed	1.00	0.872
Yes	40.6	49.8	Depressed	1.05 (0.58–1.91)	

## Conclusions

Both maternal depression and child undernutrition are prevalent in Northern Ghana. We did not find evidence of an association of maternal depression with child feeding practices or nutritional status. Further research is needed to verify the influence of maternal depression on child feeding practices and nutritional status.

## Limitations

- The translated CES-D scale used in data collection was not validated for Ghanaian caregivers and we did not include a clinical diagnostic interview to serve as a “gold standard” against which it could be compared.
- The use of one 24-h dietary recall data for estimating the indicators of complementary feeding may not provide information on the usual dietary pattern.
- We used a cross-sectional study design which is not appropriate for studying cause-and-effect relationships.

## Additional files

**Additional file 1.** Comparison of socio-demographic characteristics of mothers with and without depression. This is a table comparing socio-demographic information of mothers with and without depression.

**Additional file 2.** Study dataset. This is the dataset analysed for the manuscript.

## Abbreviations

CES-D: Centre for Epidemiologic Studies Depression; CI: confidence interval; COR: crude odds ratio; MAD: minimum acceptable diet; MDD: minimum dietary diversity; MMF: minimum meal frequency; SD: standard deviation; UDS: University for Development Studies; WHO: World Health Organisation.

## Authors' contributions

AW conceived and designed the study. HI supervised the data collection and analysed the data. The manuscript was drafted by AW. Both authors read and approved the final manuscript.

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## Competing interests

The authors declare that they have no competing interests.

## Availability of data and materials

The minimal dataset analysed during the current study are included in the published paper and its Additional file 2.

## Consent for publication

Not applicable.

## Ethics approval and consent to participate

The study was approved by the Joint Ethical Review Committee of School of Medicine and Health Sciences and School of Allied Health Sciences, University for Development Studies, Tamale, Ghana. The study participants were also informed about the objectives of the study, privacy and data protection and gave informed consent prior to being enrolled into the study.

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## References

1. GSS, GHS, ICF International. Ghana Demographic and Health Survey 2014; 2015.
2. Unicef. Strategy for improved nutrition of children and women in developing countries. New York: Unicef; 1990.
3. Range SKK, Naved R, Bhattacharai S. Child care practices associated with positive and negative nutritional outcomes for children in Bangladesh: a descriptive analysis. Washington, DC: International Food Policy Research Institute; 1997.
4. Kumar D, Goel N, Mittal PC, Misra P. Influence of infant-feeding practices on nutritional status of under-five children. *Indian J Pediatr.* 2006;73(5):417–21.
5. World Health Organization. Indicators for assessing infant and young child feeding practices: conclusions of a consensus meeting held 6–8 November 2007 in Washington DC. Washington: World Health Organization (WHO); 2008.
6. Ghana Statistical Service. Ghana: multiple indicator cluster survey with an enhanced malaria module and biomarker, 2011: monitoring the situation of children and women in Ghana; 2012.
7. Shidhaye P, Giri P. Maternal depression: a hidden burden in developing countries. *Ann Med Health Sci Res.* 2014;4(4):463–5.
8. Herba CM, Glover V, Ramchandani PG, Rondon MB. Maternal depression and mental health in early childhood: an examination of underlying mechanisms in low-income and middle-income countries. *Lancet Psychiatry.* 2016;3(10):983–92.
9. Grace SL, Eviandar A, Stewart D. The effect of postpartum depression on child cognitive development and behavior: a review and critical analysis of the literature. *Arch Womens Ment Health.* 2003;6(4):263–74.
10. Marcus SM. Depression during pregnancy: rates, risks and consequences. *Can J Clin Pharmacol.* 2009;16(1):15–22.
11. Wemakor A, Mensah KA. Association between maternal depression and child stunting in Northern Ghana: a cross-sectional study. *BMC Public Health.* 2016;16(1):869.
12. Adewuyi AO, Ola BO, Aloba OO, Mapayi BM, Okeniyi JA. Impact of postnatal depression on infants' growth in Nigeria. *J Affect Disord.* 2008;108(1):191–3.
13. Guo N, Bindt C, Te Bonle M, Appiah-Poku J, Tomori C, Hinz R, Barthel D, Schoppen S, Feldt T, Barkmann C. Mental health related determinants of parenting stress among urban mothers of young children—results from a birth-cohort study in Ghana and Côte d'Ivoire. *BMC Psychiatry.* 2014;14(1):156.
14. Surkan PJ, Kennedy CE, Hurlley KM, Black MM. Maternal depression and early childhood growth in developing countries: systematic review and meta-analysis. *Bull World Health Organ.* 2011;89(8):607–15.
15. Hurlley KM, Surkan PJ, Black MM. Maternal depression and child growth in developing countries: a focus on the postnatal period. In: Preedy VR, editor. *Handbook of growth and growth monitoring in health and disease.* New York: Springer; 2012:2023–46.
16. Stewart RC. Maternal depression and infant growth—a review of recent evidence. *Matern Child Nutr.* 2007;3(2):94–107.
17. World Health Organization. Indicators for assessing infant and young child feeding practices: part 2: measurement. Geneva: World Health Organization; 2010.
18. Cogill B. Anthropometric indicators measurement guide. Washington, D.C.: Food and Nutritional Technical Assistance Project, Academy for Educational Development; 2001.
19. Onis M. WHO child growth standards based on length/height, weight and age. *Acta Paediatr.* 2006;95(S450):76–85.

20. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas*. 1977;1(3):385–401.
21. Zhang M. *Handbook of rating scales in psychiatry*. Changsha: Hunan Science and Technology Press; 1998.
22. Stewart CP, Iannotti L, Dewey KG, Michaelsen KF, Onyango AW. Contextualising complementary feeding in a broader framework for stunting prevention. *Matern Child Nutr*. 2013;9(S2):27–45.
23. Jones AD, Ickes SB, Smith LE, Mbuya MN, Chasekwa B, Heidkamp RA, Menon P, Zongrone AA, Stoltzfus RJ. World Health Organization infant and young child feeding indicators and their associations with child anthropometry: a synthesis of recent findings. *Matern Child Nutr*. 2014;10(1):1–17.
24. Agho KE, Inder KJ, Bowe SJ, Jacobs J, Dibley MJ. Prevalence and risk factors for stunting and severe stunting among under-fives in North Maluku province of Indonesia. *BMC Pediatr*. 2009;9(1):64.
25. El Taguri A, Betimal I, Mahmud SM, Ahmed AM, Goulet O, Galan P, Hercberg S. Risk factors for stunting among under-fives in Libya. *Public Health Nutr*. 2009;12(8):1141–9.
26. Wamani H, Åström AN, Peterson S, Tumwine JK, Tylleskär T. Boys are more stunted than girls in sub-Saharan Africa: a meta-analysis of 16 demographic and health surveys. *BMC Pediatr*. 2007;7(1):17.
27. Elsmén E, Pupp IH, Hellström-Westas L. Preterm male infants need more initial respiratory and circulatory support than female infants. *Acta Paediatr*. 2004;93(4):529–33.
28. Kilbride HW, Daily DK. Survival and subsequent outcome to five years of age for infants with birth weights less than 801 grams born from 1983 to 1989. *J Perinatol*. 1998;18(2):102–6.
29. Chen S-J, Vohr BR, Oh W. Effects of birth order, gender, and intrauterine growth retardation on the outcome of very low birth weight in twins. *J Pediatr*. 1993;123(1):132–6.
30. Onis M. Enrolment and baseline characteristics in the WHO Multicentre Growth Reference Study. *Acta Paediatr*. 2006;95(S450):7–15.
31. Bentley A, Das S, Alcock G, More NS, Pantvaidya S, Osrin D. Malnutrition and infant and young child feeding in informal settlements in Mumbai, India: findings from a census. *Food Sci Nutr*. 2015;3(3):257.
32. Okronipa HE, Marquis GS, Lartey A, Brakohiapa L, Perez-Escamilla R, Mazur RE. Postnatal depression symptoms are associated with increased diarrhea among infants of HIV-positive Ghanaian mothers. *AIDS Behav*. 2012;16(8):2216–25.
33. Gold KJ, Spangenberg K, Wobil P, Schwenk TL. Depression and risk factors for depression among mothers of sick infants in Kumasi, Ghana. *Int J Gynecol Obstet*. 2013;120(3):228–31.
34. Weobong B, Ten Asbroek AH, Soremekun S, Danso S, Owusu-Agyei S, Prince M, Kirkwood BR. Determinants of postnatal depression in rural Ghana: findings from the Don population based cohort study. *Depress Anxiety*. 2015;32(2):108–19.
35. Weobong B, Akpalu B, Doku V, Owusu-Agyei S, Hurt L, Kirkwood B, Prince M. The comparative validity of screening scales for postnatal common mental disorder in Kintampo, Ghana. *J Affect Disord*. 2009;113(1):109–17.
36. Guo N, Bindt C, Te Bonle M, Appiah-Poku J, Hinz R, Barthel D, Koffi M, Posdich S, Deymann S, Barkmann C. Association of antepartum and postpartum depression in Ghanaian and Ivorian women with febrile illness in their offspring: a prospective birth cohort study. *Am J Epidemiol*. 2013;178(9):1394–402.
37. Nkum J. Comparative analysis of poverty alleviation action plans in Ghana and Zimbabwe. Poverty Reduction Project, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ); 1998.
38. Lara M, Navarrete L, Nieto L, Le H-N. Childhood abuse increases the risk of depressive and anxiety symptoms and history of suicidal behavior in Mexican pregnant women. *Revista Brasileira de Psiquiatria*. 2015;37(3):203–10.
39. Patel V, Rodrigues M, DeSouza N. Gender, poverty, and postnatal depression: a study of mothers in Goa, India. *Am J Psychiatry*. 2002;159(1):43–7.
40. Patel V, DeSouza N, Rodrigues M. Postnatal depression and infant growth and development in low income countries: a cohort study from Goa, India. *Arch Dis Child*. 2003;88(1):34–7.
41. Tomlinson M, Cooper P, Stein A, Swartz L, Molteno C. Post-partum depression and infant growth in a South African peri-urban settlement. *Child Care Health Dev*. 2006;32(1):81–6.
42. Adewuya AO, Ola BA, Aloba OO, Dada AO, Fasoto OO. Prevalence and correlates of depression in late pregnancy among Nigerian women. *Depress Anxiety*. 2007;24(1):15–21.

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