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Maternal daily work hours affect nutritional status of children in Northern Ghana

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Abstract

Background: Data on the effect of maternal daily work hours on child nutritional status is scarce in Ghana. Such data may be important in defining maternal employment policies for improved child nutrition. This study therefore sought to determine the effect of maternal daily work hours on the nutritional status of farmer and public service mothers in the northern region of Ghana.

Methods: An analytical cross-sectional survey was conducted among 320 mothers with children 6–59 months. Maternal daily work hours and dietary intake of children were assessed with a structured questionnaire. Anthropometric measurements of children were also taken to classify child nutritional status. The association between maternal daily work hours and child nutritional status was determined using both bivariate analysis and multivariate regression modelling.

Results: Majority of the children (45.1%) were aged between their second and third birthdays. The prevalence of stunting, wasting, and underweight were 17.8, 8.1, and 10.3% respectively. Only stunting ($p = 0.031$) associated significantly with maternal employment and was higher among children of farmers (22.1%) compared to public servants (12.8%). Even though maternal age ($p = 0.035$), minimum dietary diversity ($p = 0.040$), non-consumption of legumes ($p = 0.031$) and other vegetables ($p = 0.006$) associated with stunting at bivariate level, multivariate logistic regression analysis revealed that only maternal daily work hours had significant effect on stunting. Compared to mothers who worked above 6 h a day, those who worked only a maximum of 4 h were 5.4 times more likely to have stunted children [AOR = 5.375; 95% CI (1.751–16.502); $p = 0.003$].

Conclusion: Present study results show that maternal daily work hours could be an important determinant of child stunting in northern region of Ghana.

Keywords: Maternal employment, Work hours, Stunting, Dietary diversity, Children

Background

Undernutrition among children under 5 years is a public health problem in the world and accounted for 45% of all child deaths in 2011 [1]. In Ghana, stunting among children under 5 years remains high despite a 9 percentage points reduction between 2008 [2] and 2014 [3]. Maternal and child factors [1, 4] including maternal employment [5–8] have been implicated in child undernutrition and health. The World Health Organization recommends exclusive breastfeeding for the first 6 months after birth [9]. However, large studies conducted in the UK and Australia suggested that mothers who worked full time and returned to work early postpartum were less likely to exclusively breastfeed their children [10, 11]. In addition to the adverse effects of sub-optimal breastfeeding of children, general child care is thought to be poor among employed mothers [12]. Working mothers may also have less time to prepare meals at home [13] and caring for their children well-being [7]. Maternal employment may also have some important benefits such as ensuring gender equality. Employed women may contribute to household food security [14] and spend their earnings on children's nutritional related purchases [15].

Employment among women has increased over the years with corresponding increase in earnings and engagement in management and professional positions around the world [16] and in Ghana [17]. This trend is particularly obvious in industrialized countries where data are available on maternal employment and care practices [16, 18]. Available data in Ghana suggest high maternal employment in agriculture

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and public service [17]. However, data on the effects of maternal daily work hours on child nutrition is scarce. Such data may be important in defining maternal employment policies for improved child nutrition. The present study therefore aimed to determine the effect of maternal daily work hours on the nutritional status of children in the northern region of Ghana.

Methods

Study area

The study was conducted in the Tamale Metropolis, the regional capital of the northern region of Ghana. The Metropolis is one of the 26 districts of the northern region. It is located in the central part of the region and shares boundaries with the Sagnarigu District to the west and north, Mion District to the east, East Gonja to the south, and Central Gonja to the south-west. The Metropolis has a total estimated land size of 646.90 km^2 with a total population of 233,252 representing 9.4% of the region's population [19]. More than 63% of the population (aged 15 and above) is economically active, and about 93% of them are in gainful economic activities [19].

Study design, population, and sampling

This study used an analytical cross-sectional design. The target population was children aged 6–59 months whose mothers either worked as public servants or farmers who have stayed in the Metropolis for at least 3 months.

Fifteen communities (Aboabu, Builpela, Duungu, Fuo, Kakpayili, Kukuo, Lamashegu, Vitting estates, Target, Sawaba, Sakasaka, Nyohini, Village water, Zujung, and Malshegu) were selected for this study. These communities represent a mix of urban and peri-urban areas of the Tamale Metropolis where public servant and farmer mothers were selected. Households from which eligible children were selected were chosen using systematic sampling approach. A list of households in selected communities was compiled to form the sampling frame from which Excel-generated random numbers were used to select households for eligible children. Probability proportional to size was used to determine the number of households required from each community. A sample size of 320 children was selected from households for the present study. Mothers were regarded as farmers if they engaged in farming activities during the farming season, within the last 3 months preceding the interview and owned a farm. Public servants were mothers who worked in government establishments including civil servants and had stayed in the community for a minimum of 3 months at the time of the study.

Data collection

A structured household questionnaire designed for the present study was administered through face-to-face interview. Mothers were interviewed on behalf of their children. The questionnaire included sections on maternal and child demographic characteristics, feeding practices, maternal work, and household wealth-related sections. Maternal daily work hours was considered as the overall time spent in income-generating activities. Time spent in usual work, for example, teaching at primary school, was assessed as well as time spent outside teaching which earned income. The overall usual daily work hours was determined by assessing the average number of hours mothers usually spent doing income-generating activities.

Anthropometry and nutritional status assessment of children

Anthropometric measurements were done following WHO standard procedures [20] by trained data collection staff to reduce errors in measurements. Height/length measurements were done with stadiometre (Seca), and weight was measured using digital electronic weighing scale (Seca 874). All measurements were recorded to the nearest 0.1 cm or 0.1 kg for height and weight respectively. Ages of children were calculated or estimated from records of date of birth of children which were mainly obtained from child health record booklets and birth certificates.

Assessment of dietary diversity

A qualitative dietary intake assessment was used to assess dietary diversity of children. The validated seven food groups by WHO were used in a 24-h recall to determine dietary diversity of children [21]. The questionnaires were administered to mothers/caregivers who recalled the number of times in the past 24 h a child received anything to eat aside from breastmilk, including meals and snacks. The dietary diversity score ranged from 0 to 7. A child had a score of 0 if none of the food groups was consumed and 7 if all of the food groups were consumed.

WHO defines minimum dietary diversity as the proportion of children aged 6–23 months who received foods from at least four out of seven food groups [22]. In this study however, the minimum dietary diversity indicator was calculated for children 6–59 months. The validated food groups used in the assessment of minimum dietary diversity were (i) grains, roots, and tubers; (ii) legumes and nuts; (iii) dairy products; (iv) flesh foods (meats/fish/poultry); (v) eggs (fowl/guinea fowl/duck eggs); (vi) vitamin A-rich fruits and vegetables; and (vii) other fruits and vegetables.

Statistical data analysis

Data analyses were performed with the Statistical Package for Social Sciences (SPSS), version 21.0 for Windows. Categorical data were presented as frequencies and percentages, while continuous data were presented as means and standard deviations. Nutritional status was classified using *z*-scores obtained from the weight, height/length, and age

of children using WHO Anthro software. Children with *z*-scores less than − 2 SD of the median of the WHO growth standards were classified as malnourished (stunted, wasted, and underweight). The 2006 WHO growth standards were used to generate the *z*-scores (height-for-age, weight-for-height, and weight-for-age) and subsequent calculation of the prevalence of stunting, wasting, and underweight.

Both bivariate and multivariate analyses were performed to establish the association between maternal work-related factors and the nutritional status of children. Bivariate analysis was used as first-line analyses to identify the associated factors. The nutritional condition that was associated with maternal work-related factors at the bivariate level was used in multivariable analyses to determine the independent contribution of the associated factors to the nutritional status of children. Chi-square test was used to determine the association between child nutritional status (stunting, wasting, and underweight) and their maternal work-related factors as well as child factors. Multivariate logistic regression analysis was performed and included all variables that were significant in bivariate chi-square analysis. Results were considered significant at $p < 0.05$.

Results

Sociodemographic characteristics

There was no difference in the sex distribution of the children ($p = 0.094$) among farming and public service workers though, among the public servants, males were 17.6% more than females. Majority of the children (45.1%) were aged between their second and third birthdays. About 8% more of the mothers were farmers. Most of the mothers (93.1%) were married and aged between 31 and 40 years (49.4%). The dominant religion was Islam (88.1%) compared to Christianity (11.9% ($p = 0.026$). There was a statistically significant difference in the educational status of mothers ($p < 0.001$), while 92.4% of farming mothers had no formal education and 95.3% of public service mothers had tertiary-level education. Most of public servant mothers belonged to high wealth families compared to the farming mothers ($p < 0.001$) (Table 1).

Comparison of maternal and child factors among farmer and public servant mothers in Northern Ghana

The prevalence of wasting, stunting, and underweight among the children were 8.1, 17.8, and 10.3% respectively. There were no differences statistically in the prevalence of wasting ($p = 0.214$) and underweight ($p = 0.404$) between children of the two groups. However, prevalence of stunting was higher among children of farmers (22.1%) compared to children of public servants (12.8%) ($p = 0.031$). Meeting the minimum dietary diversity was significantly higher (98%) ($p < 0.001$) among children of public servants compared to those of farmers (77.9%). There was also a statistically significant difference in the daily work hours of farmer and public servant mothers ($p = 0.001$). While almost 11% of farmers worked lower (at most 4) hours in a day, only 1.4% of public servants worked similar hours. Sixteen percent more of public servants worked for 5–6 h a day than farmers (Table 2).

Predictors and determinants of stunting among children

All possible predictors of stunting measured in present study were tested for statistical association with child stunting. Maternal employment status ($p = 0.031$), working time (hours) ($p < 0.001$), and maternal age ($p = 0.035$) associated with stunting. Farming mothers, mothers whose daily work did not exceed 4 h, and mothers aged 31–40 years were more likely to have stunted children. In addition, non-consumption of legumes ($p = 0.031$) and non-consumption from other vegetables ($p = 0.006$) the previous day were positively associated with stunting in children (Table 3).

Independent contributions of predictors of stunting in children were determined using multiple logistic regression analysis. Only maternal working hours had statistically significant effect in a multivariable model which included all factors that showed varying degrees of significance in a bivariate analysis. Even though only one factor was associated with stunting, 15.4% of the variability in stunting (Nagelkerke R square = 0.154) was explained. Mothers who worked more than 6 h were less likely to have stunted children. Compared to mothers who worked above 6 h a day, mothers who worked a maximum of 4 h were 5.4 times more likely to have stunted children [AOR = 5.375; 95% CI (1.751–16.502); $p = 0.003$] (Table 4).

Discussion

This study sought to determine the effects of maternal daily work hours on the nutritional status of children in the northern region of Ghana. The main findings were that maternal work type associated with stunting but not wasting and underweight. Maternal daily work hours was the strongest predictor of child stunting, and working for more than 6 h a day had potential protective effect against stunting. Even though maternal age (31–40 years), not meeting the minimum dietary diversity, non-consumption of legumes and other vegetables associated positively with stunting, they were not statistically significant in multivariable analysis.

Table 1 Sociodemographic characteristics of mothers and children

Characteristics	Farmer *n* (%)	Public servant *n* (%)	All *n* (%)	*p* value
Sex of child				0.094
Male	85 (49.4)	87 (58.8)	172 (53.8)	
Female	87 (50.6)	61 (41.2)	148 (46.3)	
Age group of child (months)				0.056
6–11	24 (14.0)	17 (11.5)	41 (12.9	
12–23	53 (31.0)	36 (24.3)	89 (27.9)	
24–36	78 (45.6)	66 (44.6)	144 (45.1)	
37–59	16 (9.4)	29 (19.6)	45 (14.1)	
Marital status of mother				0.211
Currently married	163 (94.8)	135 (91.2)	298 (93.1)	
Currently unmarried	9 (5.2)	13 (8.8)	22 (6.9)	
Age group of mother (years)				0.686
≤ 30	68 (39.5)	65 (43.9)	133 (41.6)	
31–40	87 (50.6)	71 (48.0)	158 (49.4)	
Above 40	17 (9.9)	12 (8.1)	29 (9.1)	
Religion of mother				0.026
Islam	158 (91.9)	124 (83.8)	282 (88.1)	
Christianity	14 (8.1)	24 (16.2)	38 (11.9)	
Highest educational completed				< 0.001
None	159 (92.4)	6 (4.1)	165 (51.6)	
Primary school	10 (5.8)	0 (0)	10 (3.1)	
Junior high school	3 (1.7)	0 (0)	3 (0.9)	
Senior high school	0 (0)	1 (0.7)	1 (0.3)	
Tertiary education	0 (0)	141 (95.3)	141 (44.1)	
Household wealth index				< 0.001
High	9 (5.2)	116 (78.4)	125 (39.1)	
Low	163 (94.8)	32 (21.6)	195 (60.9)	

Our data showed that longer maternal daily work hours associated with reduced prevalence of stunting in children. Working longer hours could mean higher income and increased food expenditure and household food availability [23, 24]. A recent study involving mothers in low- and middle-income countries also reported improved infant feeding among employed mothers [25]. These factors could possibly explain the lower stunting prevalence among children of mothers who work long hours. One would expect children whose mothers work longer hours and hence may have less time for food preparation and child care [7, 13] to experience more stunting; however, this was not the case in our sample. In our setting, sociocultural factors such as child care and food preparation by grandmothers [26], older siblings, and other extended family members could be important in explaining why mothers worked longer hours and still had children who were well fed and cared for. Further, this relationship could also be explained by the phenomenon of reverse causality, where the sick child is given better care [27]. Undernutrition in children therefore gives mothers with long working hours the opportunity to give better care to children such as providing appropriate complementary feeding. The finding of this study therefore does not agree with the data from Mali [28], where time spent in income-generating activities associated negatively with height-for-age *z*-scores of children.

The association between maternal work type and stunting but not wasting and underweight could mean that maternal work has rather a long-term consequence on child nutrition. As stunting is a chronic condition which results from long-term dietary inadequacy, it is understandable that maternal work type

Table 2 Comparison of factors among farmer and public servant mothers in Northern Ghana

Indicator	Farmer *n* (%)	Public servant *n* (%)	All *n* (%)	*p* value
Wasted				0.214
Yes	17 (9.9)	9 (6.1)	26 (8.1)	
Underweight				0.404
Yes	20 (11.6)	13 (8.8)	33 (10.3)	
Stunted				0.031
Yes	38 (22.1)	19 (12.8)	57 (17.8)	
Minimum dietary diversity				< 0.001
Yes	134 (77.9)	145 (98.0)	279 (87.2)	
No	38 (22.1)	3 (2.0)	41 (12.8)	
Maternal work hours				0.001
≤ 4	18(10.5)	2 (1.4)	20 (6.2)	
5–6	106 (61.6)	115 (77.7)	221 (69.1)	
Above 6	48 (27.9)	31 (20.9)	79 (24.7)	

which is not a seldom situation is associated with it. Even though farming mothers were more likely to have stunted children than public servants in bivariate analysis, this association was lost in the multivariable analysis. Therefore, to impact child stunting status, it

Table 3 Bivariate analysis of the predictors of stunting among children of public servants and farmers in Northern Ghana

Predictor	*n*	Classification of stunting		*p* value
		Normal	Stunted	
Maternal employment				0.031
Farmer	172	134 (77.9)	38 (22.1)	
Public servant	148	129 (87.2)	19 (12.8)	
Hours of work in a day				< 0.001
≤ 4	20	8 (40.0)	12 (60.0)	
5–6	221	189 (85.5)	32 (14.5)	
Above 6	79	66 (83.5)	13 (16.5)	
Minimum dietary diversity				0.040
Yes	279	234 (83.9)	45 (16.1)	
No	41	29 (70.7)	12 (29.3)	
Age of mother (years)				0.035
≤ 30	133	118 (88.7)	15 (11.3)	
31–40	158	122 (77.2)	36 (22.8)	
Above 40	29	23 (79.3)	6 (20.7)	
Consumed legumes				0.031
Yes	165	143 (86.7)	22 (13.3)	
No	155	120 (77.4)	35 (22.6)	
Consumed other vegetables				0.006
Yes	251	214 (85.3)	37 (14.7)	
No	69	49 (71.0)	20 (29.0)	

Table 4 Multiple logistic regression analysis of the determinants of stunting among children of public servant and farmer mothers in Northern Ghana

Variable	A.O.R	*p* value	95% CI for A.O.R	
			Lower	Upper
Minimum dietary diversity				
Yes	1			
No	0.993	0.988	0.372	2.652
Maternal occupation				
Public servant	1			
Farmer	1.198	0.608	0.602	2.383
Daily work hours		0.003		
≤ 4	5.375	0.003	1.751	16.502
5–6	0.902	0.781	0.437	1.865
Above 6	1			
Age of mother (years)		0.069		
At least 30	0.559	0.312	0.181	1.727
31–40	1.261	0.667	0.439	3.626
Above 40	1			
Consumed other vegetables				
Yes	1			
No	2.105	0.061	0.965	4.592
Consumed legumes				
Yes	1			
No	1.438	0.291	0.732	2.822
Constant	0.131	0.001		

is important to consider the time investments mothers make to their work and involvements in other income activities rather than the mere type of work they do.

Meeting the minimum dietary diversity of at least four food groups in this study negatively associated with stunting. This finding is consistent with earlier studies from developed and developing countries [29–31]. Dietary diversity is shown to be a useful indicator of diet quality of children [32] and may explain the lower prevalence of stunting among children who consumed diversified diets in present study.

The association between non-consumption of legumes and other vegetables and stunting could mean that consumption from these food groups may have strong effects on stunting. The association was however weak and got lost in the multivariate model.

The prevalence of stunting, wasting, and underweight in this sample were lower than the regional prevalence [3] and other studies conducted in the region [33, 34]. It is important however to note that these studies were conducted in predominantly rural areas of the region where food insecurity is likely to be poorer than urban areas where present study was undertaken. The lower prevalence could also be explained by the declining levels of child undernutrition reported by the demographic and health surveys of Ghana [2, 3].

Our study is limited by the cross-sectional nature of the data, and hence, causal relationships cannot be implied. The present study did not measure mothers' income level directly which could possibly explain child stunting. However, household wealth status was measured through the possession of some durable household equipment which reflects income levels but was not significantly associated with child stunting in the present study. In spite of these limitations, our data have provided ample light on the maternal work-related as well as other factors on the nutritional status of children in Northern Ghana.

Conclusion

The present study results show that among other factors that may explain child undernutrition, maternal daily working hours could be an important determinant of child stunting in the northern region of Ghana.

Abbreviations

AOR: Adjusted odds ratio; CI: Confidence interval; SD: Standard deviation; SPSS: Statistical Package for Social Sciences; WHO: World Health Organization

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Availability of data and materials

The data supporting the conclusions of this article are included within the manuscript. The dataset could be obtained from the corresponding author upon reasonable request.

Authors' contributions

HG designed the study and supervised the data collection. ZA analyzed and interpreted the data. HAG and ZA produced the first draft of the manuscript. HG, HAG, and ZA reviewed the draft and agreed on the final version of manuscript.

Ethics approval and consent to participate

Informed consent was obtained from the participants before recruitment in the study after an explanation was given about the study. The study protocol was also approved by the Scientific Review Committee of the School of Allied Health Sciences, University for Development Studies, Ghana.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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