

ORIGINAL ARTICLE

MATERNAL CHARACTERISTICS AS PREDICTORS FOR STUNTING IN RURAL AGRICULTURAL HOUSEHOLDS IN INDONESIA

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ABSTRACT

This study aimed to analyze the associations of maternal characteristics and nutritional status of primary caregivers with the occurrence of stunting in children aged 6 - 59 months from rural agricultural households in Indonesia. This study used a sequential explanatory mixed method design. It started with a cross-sectional survey, followed by a qualitative study to explore community perceptions related to findings from the quantitative analysis. The survey involved 200 mother and child dyads. Multiple logistic regression was carried out with the dependent variable being the incidence of stunting in children, and maternal characteristics as independent variables. Data analysis showed that WDDS and the maternal length of education in years were significant predictors for the incidence of stunting in children. The adjusted odds ratio (AOR) for WDDS was 0.78 (95% CI 0.63 - 0.98), while for the length of education of mothers was 1.22 (95% CI 1.01 - 1.48). We also conducted a qualitative study to explore food distribution and utilization within the household. Qualitative data analysis showed that, except for pregnant mothers, "good food" was prioritized the least for mothers. The persistent barriers for utilization of quality and diverse food are access to such food rather than knowledge of what is considered "good food for health". Increasing access and consumption of diverse foods for all mothers beyond pregnancies is an important factor for preventing stunting in Indonesian children from rural agricultural households.

Keywords: Maternal Characteristics, Nutrition Status, Stunting, WDDS

INTRODUCTION

The prevalence of stunting in children under five years of age, based on the last Indonesian national health research (*Riskesdas*) in 2018 remains high at 30.8%.¹ This chronic nutrition problem disproportionately affects children from rural areas, the comparison of urban and rural prevalence was 27.3% vs 34.9%. In addition, the prevalence among children with parents working as farmers were among the highest (36.2%) compared to any other profession.¹ Thus, this population group needs extra attention. Responding to the stunting problem, the government of Indonesia has a package of nutrition interventions in 100 priority districts, one of which is Cianjur district.² Almost half of Cianjur population are working as farmers or in agricultural sector and live in rural areas. Cianjur is located about 120 km from the state capital Jakarta and around 51.2% of the population had only received elementary education level.³ Hence, it is chosen as the study site.

Smith and Haddad reported that reductions in all child stunting from 1970 to 2010 can be attributed to increases in women's status.⁴ This because, mothers are usually the primary care givers of these young children. Within agricultural families, women are often in charge of the household, including

farming, housekeeping and childcare.⁵ In addition, studies have found that maternal nutritional status and education are associated with stunting in their children.^{6,7} Hence, the characteristics of mothers, their diet and nutritional status in rural agricultural households, both as the main caregiver for under five-year-old children and as agricultural workers, are important to explore. Information obtained from the analysis of the maternal characteristics and nutritional status of mothers with children aged 6 - 59 months, from agricultural households, will provide insights on designing stunting prevention strategies for this demographic group in Indonesia.

METHODOLOGY

Study Design and Sampling Procedure

This study used a sequential explanatory mixed method design. The first stage relied on a quantitative survey to determine maternal characteristics associated with stunting that was followed by a qualitative exploration of community perception related to the findings from the quantitative study.⁸ This study was conducted in a rural area of Cianjur district-West Java from August - October 2019, in two stunting priority villages. The sampling frame used was the village's integrated

community health post list of under five year old children. Samples of mother and child dyads were selected randomly and proportional to the population size of each community health post, and overall the study involved 200 mother and child dyads.

We conducted one Focus Group Discussion (FGD) with 11 mothers who had children aged 6 - 59 months. They were selected from respondents to the quantitative survey based on discussion with local stakeholders, taking into consideration their openness, capacity to participate in a recorded group discussion without hesitation, and their ability to understand communication conducted in Bahasa Indonesia. We also conducted in-depth interviews (IDIs) with two mothers of stunted children, one mother of a non-stunted child, one village midwife, two health care workers, and one local health volunteer. The FGD and IDIs lasted for about 120 mins each, this includes second visit for IDIs whenever it was required to obtain clarifications. The interview and FGD's guideline were developed after the preliminary quantitative data analysis was done. In addition, we conducted two home visits to observe household food distribution practices, and market visits to identify food items sold in the market and their price range as an additional triangulation.

Measurement and Variables

Data on maternal characteristics such as age, years of education, income, household size, and occupation status were obtained via interview using a structured questionnaire. We also conducted a 24 hours food recall to obtain the Women Dietary Diversity Score (WDDS) of the mother.⁹ Height of mothers, and children who were able to stand up on their own, was measured with a stadiometer with a capacity of 200 cm and an accuracy of 0.1 cm. Children's length, measured when a child was unable to stand up on their own, was measured with a horizontal stature meter (Gesunde Medica - SH-GM002) with the maximum length of 99 cm by two enumerators. Measurements were performed with children laying down on a hard surface without socks or shoes. The mother's Body Mass Index (BMI) was measured with a four electrode Bioelectrical Impedance Analysis (BIA) monitor (OMRON® Karada Scan Body Composition Monitor HBF-358-BW) in light clothing without shoes or socks. All data were collected by trained enumerators.

Data Analysis

Children's height was analyzed using the WHO Anthro 3.2 software, and stunting was defined as HAZ < -2 of the WHO Child Growth Standards median.¹⁰ Maternal education, household size, WDDS, BMI and age were presented as a continuous

variable. The WDDS derived from the food recall ranges from 0-9 and is equal to the total number of food groups consumed by the mothers. The family monthly income was sorted into two groups; one above, and one below 1 million rupiah as the commonly use cut off in Indonesia. This is equal to \$2.2 USD per day income. Occupation status was grouped into either working or stay at home mothers, where working mothers were defined as those who participated in the family's agricultural production and income earnings.

We conducted descriptive analysis for all variables, followed by multiple logistic regression to determine maternal characteristics and nutrition status as predictors for the occurrence of childhood stunting. All variables were tested for multicollinearity beforehand. Data was analyzed using IBM SPSS 24 and graphs were constructed using Microsoft excel 2010. The main topics explored in the qualitative data analysis were 1) Mother's role in food provision 2) Food distribution within the household, and 3) Factors operating to discourage diverse diet. Data analysis was conducted in Bahasa Indonesia using open coding method assisted with the NVivo 12 software, and only selected quotes were translated into English.

RESULTS

Quantitative Study

Respondents Characteristics

Table 1 presents the descriptive statistics of all continuous variables collected in the study, while figure 2 describes the categorical variables. The mean age for the mothers was 31.3 (SD 7.0) years old and the mean length of education was 7.1 (SD 1.8) years, well below the basic education standard of 9 years enacted by the government. Regarding dietary diversity, the mean WDDS score for mothers was 2.9 (SD 1.4) out of a maximum score of 9. Further data analysis showed that the three most common food groups consumed by mothers were starchy staples (100%), dark leafy vegetables (67%), and legumes (50.5%). The mean BMI was 25.8 kg/m² (SD 4.2), which can be categorized as overweight based on the current WHO recommended BMI for Asian populations of 23 kg/m²,¹¹ with a mean height of 149 cm (SD 4.8) or considered as short (below 150 cm).¹² The mean household size was 3.9 (SD 0.9), the small house hold size can be partly explained by the high active contraceptive use among reproductive age women in the sub-district. Active family planning participants in the sub district was accounted almost 80% of all couples within the reproductive age.¹³ For children, the mean age was 33.9 (SD 15.7) months old, and the mean HAZ was -1.56 (SD 1.3). (Table 1).

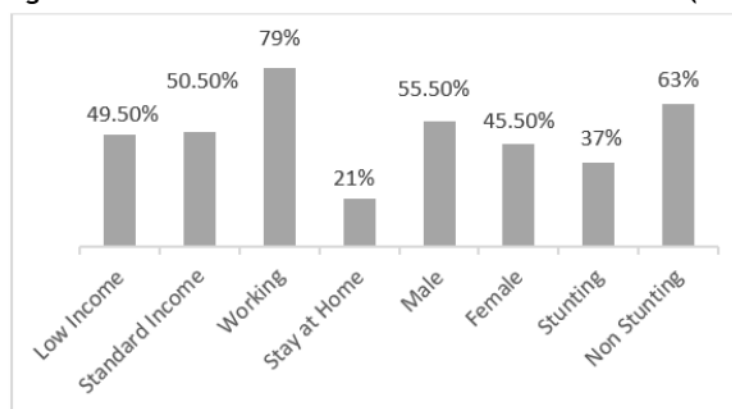
Table 1 Continuous Variables of Mother and Child Characteristics (N = 200)

Mother's Characteristics	Mean	Std. Deviation
Maternal Age in years	31.3	7.0
Length of Education in years	7.1	1.8
BMI	25.8	4.2
WDDS	2.9	1.4
Household Size	3.9	0.9
Children's Characteristics	Mean	Std. Deviation
Age in months	33.9	15.7
HAZ	-1.56	1.3

The majority of mothers (79%) were working mothers who took part in their family's agricultural production process. Almost half of all households interviewed had family income lower than 1 million rupiah per month (under \$2.2 USD per day). The data also showed that when the cut off was increased to 1.8 million rupiah per month (\$4 USD

per day), which was the regional basic income of the Cianjur district in 2019, the majority (88%) of all families had earnings below this standard. The children comprised 55.5% male with the rest were female, and the prevalence of stunting was at 37%. (Figure 2)

Figure 2 Categorical Variables of Mother and Child Characteristics (N = 200)



Maternal characteristics as predictors for stunting

Multiple logistic regression showed that the WDDS and the maternal length of education in years were the only significant predictors for stunting in children after adjustment for sex and age of the children. The adjusted odds ratio (AOR) for WDDS was 0.78 (95% CI 0.63 - 0.98), while for the length of education for mothers was 1.22 (95% CI 1.01 - 1.48) (Table 2).

Food Provision and Distribution

Since the quantitative study found that maternal education and WDDS are two significant predictors for childhood stunting, we explore more on the decision-making regarding food and their distribution within the household. Domestic expenses, including for food provision and distribution, are largely in the control of mothers. Even though mothers are in charge of food provision and distribution within the household, they often

eat the least. Children are the first priority while non-pregnant mothers are last in food distribution of "good food" was mentioned repeatedly in FGDs with mothers and interviews with key informants.

"As long as I remember, decision regarding food is in the hand of the mothers. For food, they asked the money to their husband but the mothers who decide what kind of foodstuff to buy, what to cook, when to cook them and to whom the food should be distributed, those things are the mothers. For food distribution, ya mostly the mothers will prioritize the children not the fathers, but she is the last in the priority but this changes when the mothers are pregnant because she is eating for two." (IDI, Village Cadre - the respondent was born in the village and she is 50 years old)

Table 2 Multiple Logistic Regression of Mother's Characteristic as Predictors for Stunting

Variables	P	AOR		95% CI
Income Group	0.634	1.117	0.708	1.763
Household Size	0.599	1.099	0.774	1.560
Mothers' Occupation Status	0.643	0.853	0.436	1.670
Mothers' Age	0.177	1.036	0.984	1.090
Mothers' Length of Education in years	0.048*	1.216	1.002	1.476
Mother's BMI	0.139	0.944	0.875	1.019
WDDS**	0.042*	0.78	0.62	0.98
Child's Age	0.001*	1.04	1.01	1.06
Child's Sex	0.67	1.14	0.62	2.13
Constant	0.17	0.87		

* $P < 0.005$, Chi-Square = 24.6, $df = 9$ and $p = 0.003$ (< 0.05); Nagelkerke R Square 0.16

** WDDS = Women Dietary Diversity Score

Facilitators and Barriers for Quality and Diverse Diet

The majority of households were small holder farmers with low incomes, and did not own a refrigerator. Hence, persistent barriers to the utilization of quality food, especially for animal-based diets are access to such food, both economically and physically. The theme of limited access emerged in both FGDs and IDIs with our key respondents.

"We never run out of food, I mean rice and vegetables are abundant.... but for diverse food, like good foods we like to eat (and) that is good for health too, that is our problem. We only eat what is available rice, vegetables, tempeh and tofu, eggs only for the children.... chicken? fish? The market is far away and it only opens once a week." (IDI, Mother 3)

Field observations showed that the food items sold in stalls in the market that only opens once a week in Tuesday were mostly vegetables, tempeh, tofu, and salted and dried fish. Fresh meat, chicken and fish were expensive and rarely sold, and so lacked demand. The larger market, which opened daily, was in the neighboring sub district. It can be reached in around 1 hour by motor cycle, making it a 2-hour return journey. As a result, women in the villages rarely went to this market.

DISCUSSION

Stunting in children is an important nutrition problem in developing countries, including in Indonesia where the problem disproportionately affects rural farming households. Not surprisingly, the stunting prevalence found in our study site was high (37%). Mothers in agricultural households from rural areas play an important role in child nutrition and care, as well as income generation for the

family. The majority of mothers (79%) in our study site participated in agricultural production while also assuming the main role in the household for food provision.

In contrast to previous studies conducted in Ethiopia and Burundi,^{14,15} our study showed that household income did not significantly correlate to child's stunting. This can be explained by the fact that the family income of the majority of the family in our study (88%) was below the basic regional income. Hence, their income was a weak predictor for stunting. The same applied to household size, the common cut off for large household size in various studies were family members of > 5 .^{15,16} The fact that the average family size was relatively small 3.9 (SD 0.9) made this explanatory variable was not a significant predictor. While for maternal BMI, it is a strong predictor for stunting when the mothers are under weight (BMI < 18.5 kg/m²),¹⁷ in our study site the average maternal BMI was 25.8 kg/m² (SD 4.2) which mean within the normal to overweight category. This might highlight another finding that energy intake among rural mothers from agricultural household in our study site was adequate while dietary diversity as source of micronutrient intake was not.

Data analysis showed that mother's WDDS (AOR 0.78) and length of education (AOR 1.22) are significant predictors for stunting in children aged 6 - 59 months old from our study site. The increasing probability for stunting in children of mothers with more years of formal education is paradoxical to the thesis that higher maternal education is associated with better child nutrition. Studies in Ethiopia, Bangladesh showed that increased in maternal education lower the odd of stunting. stunting prevalence in young children increased significantly with lower maternal education.^{18,19} However, a study in Nigeria highlighted that only maternal formal education beyond primary school was

significantly associated with the child's Height for Age Z score.²⁰ Findings from the statistical analysis in this study demonstrated that the mean length of education amongst mothers was low (7.1 years), and below the Indonesian basic education level of 9 years. Thus, we argue that the current level of formal education of mothers from our study site is inadequate to contribute meaningfully to improving children's nutrition outcome.

The lower odds of stunting found amongst children whose mothers had higher WDDS scores substantiates previous finding on risk factors for childhood stunting across 137 countries stating that better nutrition amongst mothers will lower stunting cases in children.²¹ A case control study in Bangladesh found that children whose mothers consumed lower than five food groups had almost twice the risk of being stunted.²² A study in rural India found that increased micronutrient intake from diverse diets in mothers was associated with their infants' birth size and the contributing food groups were milk, dark leafy green vegetables, and fruit.²³ Fetal Growth Retardation (FGR), resulting in low birth weight or length, has been consistently linked to stunting. While, higher micronutrient intake beyond conception correlates to lower FGR and subsequently decreases the odds for future stunting.^{24,25}

Further, our qualitative data analysis found that mothers are often last in the food distribution priority within the household. This is a common practice in many low- and middle-income countries, including among pregnant women.^{26,27} However, in our study we showed that pregnant women are prioritized for food allocation within the household. Efforts to increase the WDDS should therefore be directed to ensure sustainable access to micronutrient rich food for the whole household, at all times, as the shift in women dietary diversity during pregnancy alone might not be adequate in ensuring optimal fetal growth. Qualitative data analysis also showed that domestic expenses, including for food and health, are in the control of the mothers. However, the persistent barriers for utilization of quality and diverse food, identified in our qualitative study, are access to such food rather than knowledge of what is considered to be "good food for health". This finding is in line with a previous systematic review and meta-analysis study which showed that nutrition education alone only works in a food secure context.²⁸ Studies in Malawi and Ethiopia also highlighted the importance of both nutrition knowledge and market access for dietary diversity among small holder farmers, such as found in this study.^{29,30}

LIMITATION

This study was conducted in a very specific area of agricultural villages in Indonesia which largely depend on small holder rain fed rice farming with low income. Hence, generalization on any other study setting might need careful consideration. In addition, the model did not include other explanatory variables such as birth spacing, maternal income as separate income from the household's as well as asset ownership by mothers. Therefore, future studies should include these explanatory variables.

CONCLUSION

Increasing access and utilization of diverse foods as a source of micronutrients for mothers can reflect sustainable utilization of micronutrient rich food in the household. Efforts to increase the WDDS should therefore be directed to ensure sustainable access to micronutrient rich food for the whole household, at all times, as the shift in women dietary diversity during pregnancy alone might not be adequate in ensuring optimal fetal growth. In addition, increased women's formal education beyond elementary school level and provision of nutrition education at elementary school level should be able to contribute in stunting reduction strategy. Further, increasing market access will also address barriers to utilization of diverse food in rural agricultural area in Indonesia.

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Conflict of Interest: The authors declare there is no conflict of interest

Ethical Approval

This study was part of a larger study titled "The role of women's empowerment in agricultural household food and nutrition security in Cianjur, West Java" and had been conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the Ethical Committee of IPB

University in Bogor (Number 210/IT3.KEPMSM-IPB/SK/2019).

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