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Correlation Of Cultural Beliefs and Chronic Energy Deficiency During Pregnancy with Stunting in Children Aged 0-24 Months in Jatipurno, Wonogiri

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ABSTRACT

Introduction: Stunting is a multifactorial issue that results in impaired growth and development in children. Maternal nutritional history, especially Chronic Energy Deficiency (CED), has an impact on child stunting. Infants with low birth weight are more likely to be stunted if their mothers have CED. The high rate of stunting in Jatipurno, Wonogiri is also influenced by culture beliefs in local community, which includes early supplemental feeding, dietary restrictions for pregnant mothers, and a high birth rate. This study aimed to see the correlation between CED during pregnancy and cultural beliefs (early complementary feeding, maternal food restrictions during pregnancy, and number of children) with stunting in children aged 0-24 months.
Methods: This was an observational study with a retrospective case control approach. Purposive sampling based on the inclusion and exclusion criteria was used in this study. Subjects were children aged 0-24 months in Jatipurno, Wonogiri with normal and stunted nutritional status. Stunted children were allocated into case group (n=16) and normal children were allocated into control group (n=16). Statistical analysis performed with chi-square and multiple logistic regression using SPSS.
Results: There was a significant relationship between CED during pregnancy with the incidence of stunting in children aged 0-24 months in the Jatipurno Health Center Working Area, with a p value of 0.008 ($p<0.05$) and OR value of 27.323.
Conclusion: CED during pregnancy was a significant risk factor for stunting in children aged 0-24 months in Jatipurno, Wonogiri. There was no significant correlation between cultural beliefs (early complementary feeding, maternal food restrictions during pregnancy, and number of children) with stunting in children aged 0-24 months.

Keywords: chronic energy deficiency; stunting; number of children; maternal education; food taboo

INTRODUCTION

Stunting is a nutritional issue that results in impaired growth and development in children. Stunting during the first 1000 days of a child's life, from conception to two years of age, has a detrimental effect on children by increasing the potential of developing chronic diseases as adults. The height-for-age Z-score threshold of stunting is -2 SD to -3 SD for stunted and -3 SD for severely stunted [1].

According to the 2013 Indonesian national health survey (Riskesdas) findings, the prevalence of stunting among under-five children was 37.2%, and in 2018 the prevalence slightly reduced to 30.8%.

However, the prevalence of stunting in Indonesia is considered alarming because it is above the WHO limit for the amount of stunting in a country, which is a maximum of 20% or one-fifth of the number of children under five years old in the country[2].

Stunting is a multifactorial issue. Significant factors contributed to stunting include maternal conditions during pregnancy: height, body mass index, and mid upper arm circumference (MUAC) which represent Chronic Energy Deficiency (CED). Maternal height is associated with stunting. Mothers who are short tend to have stunted children, while mothers with normal height tend to have children with normal growth. Genetic, environmental and nutritional factors affect human growth, including height. If the mother's height is influenced by genetic factors, the child is likely to inherit the gene and be at risk of stunting[3]. Mothers with normal weight gain according to Body Mass Index (BMI) standards during pregnancy tend to give birth to normal weight babies (2500-4000 grams). Conversely, mothers who experience weight loss or gain that does not meet BMI recommendations are at risk of giving birth to low birth weight babies (LBW), which can increase the risk of stunting if not addressed quickly. CED refers to a condition of prolonged macronutrient deficiency namely energy and protein[4]. MUAC of less than 23.5 cm was an indication of CED. Pregnant women who are undernourished in the first trimester were at a higher risk of delivering stillborn and premature birth, while pregnant women who are undernourished in the last two trimesters were at a higher risk of delivering stunted offsprings[5]. Studies showed that pregnant women with CED had a 2-3 times higher chance of delivering infants with low birth weight due to poor fetal growth. Low birth weight infants were often associated with stunting at a later life[6,7].

Nutritional status during pregnancy was the results of dietary pattern which was strongly influenced by cultural norms and beliefs. Previous study discussed that cultural norms and beliefs prevailing in society could impact an individual's decision to consume or prohibit certain types of food. It is evident that each region has different dietary pattern guided by food taboo and cultural beliefs, particularly the diets of pregnant women. In many areas of Central Java, there were food taboo in which pregnant women were prohibited from consuming eggs and red meat because the society believed it would cause complication and profuse bleeding during labor [8]. Other animal proteins namely squid, shrimp, crab, goat meat, duck eggs and fish were also prohibited because it is believed they might cause foul smell of breastmilk. The beliefs and food taboo were contrary to medical review in which pregnant women require additional protein consumption for fetal development [8]. Another study mentioned that pregnant women in Madura, East Java were traditionally prohibited from eating foods high in protein such as squid and stingray due to the belief that squid could complicate labor, while stingray could impact the physical characteristics of the fetus. In addition, miscarriage was also a concern when consuming "hot" foods such as mutton, durian, pineapple, jackfruit, and chili. Ancient customs divided foods into hot and cold categories, which represent attributes rather than actual temperatures[9]. Hence, cultural beliefs limited access to protein-source foods for pregnant women.

Jatipurno district in Wonogiri, Central Java is one of the areas with the highest incidence of stunting in Wonogiri Regency in 2021. The prevalence of stunting in Jatipurno sub-district in 2021 was 14.3% and increased to 18.6% in 2022. Based on a preliminary qualitative study conducted with the Head of Jatipurno Health Center and health cadres in May 2023, there were many cultural beliefs and food taboo that contribute to the high prevalence of stunting in Jatipurno district. Concerning beliefs in the area include dietary restriction among pregnant women, early complementary feeding, and relatively high birth rates.

Based on the literature review and the result of preliminary study in Jatipurno Health Center, there were limited studies focusing on CED in pregnant women and cultural beliefs with stunting in children under 2 years old. Hence, this study aimed to see the correlation between CED during pregnancy and cultural beliefs in local community (early complementary feeding, maternal food

restrictions during pregnancy, and number of children) in Jatipurno, Wonogiri with the incidence of stunting in children aged 0-24 months.

METHOD

This study is an observational study with a retrospective case control approach. This research was conducted in Jatipurno district, Wonogiri on March 2024. Purposive sampling method was used in this study. The inclusion criteria were as follow: 1) Children aged 0-24 months who had a Mother and Child Health (KIA) book containing latest nutritional examination using the height-for-age index and the mother's MUAC during pregnancy; 2) Parents agree to participate in the study. Children were excluded from the study if they had chronic diseases and/or congenital disorders. Signed informed consent were taken from parents before participating in the study. This study was approved by The Health Research Ethics Committee Dr. Moewardi Hospital number 418/II/HREC/2024.

Subjects of this study were children aged 0-24 months in Jatipurno district, Wonogiri with nutritional status: normal and stunted. Stunted children were allocated into case group (n=16) and normal children were allocated into control group (n=16).

Child nutritional status was taken from latest nutritional examination with height-for-age index in KIA book. Height-for-age Z-score of <2 was considered stunted, and Z-score of ≥ 2 was considered normal. CED was determined from maternal MUAC during pregnancy which was taken from KIA book. MUAC <23.5 cm was considered CED and MUAC ≥ 23.5 cm is considered as normal nutritional status. Early complementary feeding was obtained from questionnaire. Complementary feeding below 6 months of age was considered early complementary feeding and above 6 months was considered appropriate complementary feeding. Number of children was obtained from questionnaire. Number of children was classified as “1-2 children” which were according to national family planning recommendation, and “>2 children” which were more than the recommendation. Maternal food restrictions during pregnancy were obtained from questionnaire. Food restrictions were classified as “Yes” if mothers had any dietary restrictions during pregnancy and “No” if mothers did not have dietary restrictions.

Confounding variables in this study were birth weight, maternal education, maternal age, and socioeconomic status. Birth weight data was taken from KIA book. Birth weight of <2500 grams was classified as low birth weight, and ≥2500 grams was classified as normal. Maternal education was obtained from questionnaire and classified into “lower education” for mothers with elementary and junior high school education level, and “higher education” for mothers with high school and college education level. Maternal age was obtained from questionnaire and classified as “<30 years” and “>30 years”. Socioeconomic status was obtained from questionnaire and classified as “low income” for families with monthly income below the minimum wage, and “high income” for families with monthly income equal to or above the minimum wage.

Statistical analysis was performed with SPSS 25. Statistical tests used in this study was chi-square and multivariate logistic regression analysis. The results were considered significant if *p-value* < 0.05.

This study was approved by The Health Research Ethics Committee Dr. Moewardi Hospital number 418/II/HREC/2024.

RESULT

Basic characteristics of study subjects was shown on Table 1. According to Table 1, the number of subjects with CED mothers during pregnancy was 31.3%. The majority of subjects had families with 1-2 children (84.3%) and appropriate complementary feeding at ≥6 months (87.5%). The most common complementary feeding given to subjects was instant porridge and homemade porridge. Only a small amount of 28.1% subjects had mothers with dietary restrictions during pregnancy with the most common foods namely instant porridge, pureed fruit, and baby cereal (data not shown on table).

Table 1. Characteristics of Study Subjects

Characteristics	n (%)	Mean ± SD
Child Nutritional Status		
Stunting (Z-Score -2SD - -3SD)	16 (50)	0.50 ± 0.508
Normal (Z Score +3SD - -1SD)	16 (50)	
CED		
MUAC < 23.5 cm	10 (31,3)	0.69 ± 0.471
MUAC ≥ 23,5 cm	22 (69,7)	
Number of Children		
1-2 children	27 (84,3)	0.84 ± 0.369
> 2 children	5 (15,6)	
Complementary feeding		
< 6 months of age	4 (12,5)	0.87 ± 0.336
≥ 6 months of age	28 (87,5)	
Type of complementary food		
Water/coconut water	0 (0)	3.09 ± 0.963
Homemade porridge	13 (40,6)	
Soft banana	3 (9,4)	
Instant porridge	16 (50)	
Maternal food restrictions		
Yes	9 (28,1)	0.75 ± 0.440
No	23 (71,9)	
Types of food restrictions		
Egg	0 (0)	0.16 ± 0.628
Meat	1 (3,1)	
Seafood	1 (3,1)	
Others	30 (93,8)	
Reason of food restrictions		
Belief of the Local Community	0 (0)	0.53 ± 1.191
Parental Advice	3 (9,4)	
Disrupts Children's Health	1 (3,1)	
Dislike	2 (6,2)	
Others	26 (81,3)	
Total	32 (100)	

Table 2 showed the result of Chi-square test on the correlation between CED during pregnancy and cultural beliefs (early complementary feeding, maternal food restrictions during pregnancy, and number of children) with incidence of stunting in children aged 0-24 months. CED during pregnancy ($p = 0.022$) and number of children ($p = 0.045$) showed significant correlation with incidence of stunting in children aged 0-24 months. However, there was no significant correlation between early complementary feeding and maternal food restrictions during pregnancy with incidence of stunting in children aged 0-24 months ($p>0.05$).

Table 3 showed the result of Chi-square test on the correlation between confounding variables (birth weight, maternal education, maternal age, and social economy status) with incidence of stunting in children aged 0-24 months. There was a significant correlation between maternal education with incidence of stunting ($p = 0.033$). Other variables namely low birth weight, maternal age, and social economy status showed no significant correlation with incidence of stunting in children aged 0-24 months ($p>0.05$).

Multivariate analysis result was displayed in Table 4. The following variables were included in the multivariate analysis: CED during pregnancy, number of children, and maternal education as the variables were statistically significant during the bivariate analysis. The Nagelkerke R^2 value was 0.673, which could be inferred that CED during pregnancy, number of children, and maternal education could

explain the incidence of stunting in this study by 67.3% and the remaining 32.7% could be explained by other variables not included in this study.

From the multivariate analysis in Table 4, CED during pregnancy was significantly correlated with stunting (p = 0.008). The Odds Ratio (OR) for CED during pregnancy with stunting was 27.323.

Table 2. Chi-Square test on the correlation between CED during pregnancy and cultural beliefs with child stunting

Variable	Child nutritional status		*p-value*
	Control (Normal) n (%)	Case (Stunting) n (%)	
CED			
MUAC < 23.5 cm	2 (12.5)	8 (50)	0.022*
MUAC ≥ 23,5 cm	14 (87.5)	8 (50)	
Complementary feeding			
< 6 months of age	0 (0)	4 (25)	0,101
≥ 6 months of age	16 (100)	12 (75)	
Number of Children			
1-2 children	16 (100)	11 (68.75)	0.045*
> 2 children	0 (0)	5 (31.25)	
Maternal food restrictions			
Yes	2 (12.5)	7 (43.75)	0,220
No	14 (87.5)	9 (56.25)	
Total	16 (100)	16 (100)	

**p-value* significant at <0.05

Table 3. Chi-Square test on the correlation between confounding variables with child stunting

Variable	Child nutritional status		*p-value*
	Control (Normal) n (%)	Case (Stunting) n (%)	
Birth Weight			
< 2500 grams	0 (0)	3 (18.75)	0.226
≥ 2500 grams	16 (100)	13 (81.25)	
Maternal Age			
> 30 years old	3 (18.75)	5 (31.25)	0.685
< 30 years old	13 (81.25)	11 (68.75)	
Socioeconomic status			
Low income	5 (31.25)	10 (62.5)	0.077
High income	11 (68.75)	6 (37.5)	
Maternal education			
Lower Education	4 (25)	10 (62.5)	0.033*
Higher Education	12 (75)	6 (37.5)	
Total	16 (100)	16 (100)	

**p-value* significant at <0.05

Table 4. Logistic Regression Analysis

Variable	B	Odds Ratio	*p-value*	Nagelkerke R^2
CED	3.308	27.323	0.008	
Number of Children	22.970	9458140657.890	0.999	0.673
Education Level	2172	8.779	0.075	

DISCUSSION

CED during pregnancy

Bivariate and multivariate analysis showed significant relationship with incidence of stunting in children aged 0-24 months. The OR for CED during pregnancy with stunting found in our study was

relatively high. Women with CED during pregnancy were 27 times more likely to have stunted children than women with normal nutritional status during pregnancy. Our study found that CED during pregnancy was a significant risk factor for child stunting.

The results of this study were supported by research in the working area of Tewiri Health Center, Ambon in which they found that pregnant women with CED during pregnancy had a 4.85 times higher chance of delivering stunted children compared to mothers with normal nutritional status[5]. Another study in the working area of Snaru Health Center, North Lombok also concluded a significant relationship of mothers with a history of CED with the occurrence of stunting by 9 times compared to normal mothers [10].

Fetal health is influenced by the condition of the pregnant mother. Anemia and/or CED in pregnant women could significantly impact fetal health, which later could lead to child stunting[11]. MUAC <23.5 cm was commonly used as a cutoff to determine CED. Another study mentioned that lack of nutritional intake, namely energy and protein, during pregnancy often lead to complications of offsprings, the most common effect being low birth weight. Low birth weight infants were more susceptible to stunting than normal birth weight infants[5].

Moreover, this study found that CED during pregnancy, number of children, and maternal education could explained the incidence of stunting in this study by more than 60%. This finding is in line with research conducted at the Pringgarata Health Center in 2024, which found that 40% of mothers with CED have children with stunted nutritional status and only 20% of mothers with CED have children with normal nutritional status [12].

Other variables not included in this study which could contribute to stunting including infectious diseases, gender, energy and protein intake, health services, and parental occupation[13]. These variables were not examined in this study because this study was designed to focus on determinants commonly found in Jatipurno, Wonogiri namely CED and cultural beliefs (early complementary feeding, maternal food restrictions during pregnancy, and number of children). In addition, we also specifically explored about types of food restrictions and reasons for food restrictions.

Number of children and maternal education

Bivariate analysis showed significant correlation between the number of children and maternal education with incidence of child stunting. However, multivariate analysis showed no significant correlation between the number of children and maternal education with the incidence of child. In conclusion, the number of children and maternal education was not a significant risk factor for child stunting in this study. This is because there have been improvements in the existing health programs at the Jatipurno Health Center, such as the nutrition assistance program in the form of providing additional food to toddlers with a z-score of less than -2SD at each posyandu. In addition to nutritional assistance, periodic training is also held for posyandu cadres at Jatipurno Health Center regarding the provision of stunting counseling, information, and education.

The result of this study was in line with previous research in Puskesmas Titi Papan, Medan, North Sumatra in which they found no significant relationship between the number of children with the incidence of stunting in children aged 1-60 months[14]. However, our result contradicted previous research in Penyirapan Village, Bandung, as they found that families with more than 2 children were 5.18 times at risk of having stunted children compared to families who only have 1 or 2 children[15]. The differences between our study and previous study were most likely caused by the number of samples used and the age of the study subjects. In this study, the number of samples used was limited compared to previous studies. In addition, in the previous study, the subjects were children aged 12-59 months and in this study was 0-24 months.

Our study which found maternal education was not a significant risk factor for stunting was supported by a study in Tembalang, Semarang. The previous study discovered that there was no relationship between maternal education level and the incidence of stunting in children aged 6-35 months old[16]. Another study in Balen, Bojonegoro also supported our study in which maternal education level had no correlation with incidence of stunting in children aged 13- 59 months old [17].

Maternal food restrictions, early complementary feeding, low birth weight, maternal age, and socioeconomic status with child stunting

This study found that maternal food restrictions during pregnancy, early complementary feeding, low birth weight, maternal age, and socioeconomic status were not correlated with stunting in children aged 0-24 months.

Our result on maternal food restrictions during pregnancy was in line with past research in Bandung which found no relationship between dietary restrictions during pregnancy with the incidence of stunting [18]. Another study in Malang also supported our results because they found no significant correlation between dietary restrictions in pregnant women with the incidence of stunting in Malang. The food restrictions mentioned in the study including spicy food, durian fruit, and fish[19].

Previous study in Pati about risk factors of stunting in children aged 12-36 months old supported our result that there was no correlation between early complementary feeding and the incidence of stunting in children [20]. Another study in Cirebon also found similar result that there was no significant correlation of early complementary feeding with stunting in children aged 6-24 months old [21].

This study found that low birth weight was not a significant risk factor for stunting in children under 2 years old. This was in accordance with previous research in Pandeglang, Banten which found no relationship between low birth weight of < 2500 grams and stunting [22]. Another study in Puskesmas Taraweang, South Sulawesi also found that low birth weight was not a risk factor for stunting [23].

Our result on maternal age was in accordance with previous research in Central and West Java that there was no relationship between maternal age during pregnancy and the incidence of stunting [24,25].Another study in Sumatra also found similar result that maternal age during pregnancy was not a risk factor for child stunting[26]. This could be because maternal age was an indirect factor that influences stunting and there were other stronger determinants of stunting, namely infectious diseases as well as energy and protein intake [25].

Socioeconomic status was not a significant risk factor for stunting in this study. Our result was supported by previous study in Brombong Health Center, Makassar which concluded that family socioeconomic factors were not related to the incidence of stunting [27,28]. Socioeconomics was highly influenced by the number of children in the family. Although the majority of subjects in our study had low socioeconomic status, but the number of children in the family was relatively small of only 1-2 children. It was possible that the family in our study was able to provide appropriate nutrition for their children.

This study has some limitations. First, the number of subjects in this study was limited due to the time constraint during data collection and may limit the power of the study. Second, this study used secondary data from KIA book (nutritional status of children and MUAC of mothers) and the measurements were carried out by different village cadres, hence reducing the reliability of the measurement results.

Our research was among the first to incorporate local cultural beliefs in Jatipurno, Wonogiri into an observational, case-control study. Another strength was the thorough statistical analysis which was performed with multiple logistic regression and generated an Odds Ratio.

CONCLUSION

Based on the results from bivariate and multivariate analysis, this study found that CED during pregnancy was a significant risk factor for stunting in children aged 0-24 months in Jatipurno, Wonogiri with OR value of 27.323. However, our study found that there was no significant correlation between cultural beliefs in local community (early complementary feeding, maternal food restrictions during pregnancy, and number of children) with stunting in children aged 0-24 months.

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