BKM Public Health & Community Medicine
Berita Kedokteran Masyarakat

Volume 40 **Number** 12, 2024, **Pages** e18088
DOI: 10.22146/bkm.v40i12.18088

Underprivileged families and the incidence of stunted at birth in Sleman Regency based on the 2018-2019 Sleman Health and Demographic Surveillance System: a cohort study

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Submitted:
December 4th, 2024
Accepted:
December 27th, 2024
Published:
December 30th, 2024

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Abstract

Purpose: The incidence of stunting is a problem that needs to be resolved immediately. Stunting in children contributes to causing significant state losses, because the state must bear the costs of degenerative diseases as a result of the long-term impact of stunting. The family's economic status plays a role in the nutritional status of newborns. The purpose of this study was to determine the risk of stunted babies being born in underprivileged families. **Methods:** This study utilizes data from the 2019 Sleman Health Demographic Surveillance System (HDSS), employing a cohort method. The data used in this study went through the data-cleaning stage. The analysis carried out consisted of three things: descriptive, bivariate, and multivariable analysis. The number of samples used was 168. **Results:** The prevalence of stunting was 28.6%, and the prevalence of underprivileged families was 31.5%. The analysis revealed that babies born to disadvantaged families were 1.72 times more likely to be born stunted compared to babies born to prosperous families, as indicated by the multivariable analysis. **Conclusion:** The birth weight of babies is a significant factor influencing the incidence of stunted babies. Based on multivariable modeling, babies born to underprivileged families have a higher risk of being stunted, but this is not statistically significant. The same model shows that other variables that increase the risk of babies being born stunted are low birth weight (LBW).

Keywords: cohort study; HDSS Sleman; stunted babies; underprivileged

INTRODUCTION

Stunting is a severe global problem. Based on WHO data from 2021, it is estimated that the prevalence of stunting worldwide decreased from 23.2% to 22% between 2015 and 2020, affecting 156 million children in 2015 and 149.2 million children in 2020 [1]. The prevalence of stunting in 2020 was highest in Oceania (41.4%, or 600,000 children) and Central Africa (36.8%, or 11.3 million children) [1]. The lowest prevalence of stunting was observed in Australia (2.3%), Western Europe (2.3%, or 200,000 children), and Northern Europe (2.9%, or 200,000 children) [1]. The prevalence of stunting in 2020 in the Southeast Asia region was 27.45%, affecting 15.3 million children [1]. The prevalence of stunting in Indonesia in 2021 was 24.4%, a decrease of 6.4% from 30.8% in 2018 [2]. This figure also decreased compared to the 2013 Riskesdas results, which reported a national stunting percentage of 37.2% [2]. The prevalence of short toddlers in DIY in 2018 was 12.37% and this figure decreased to 10.69% in 2019 [3]. The highest prevalence of short toddlers was observed in Gunung Kidul Regency, at 17.94%, while the lowest prevalence was found in Bantul Regency, at

7.73%. Sleman Regency 8.38%, Yogyakarta City 11.3% and Kulon Progo Regency 12.69%. From this figure, it can be seen that the prevalence of very short toddlers in DIY is lower compared to the 2018 Riskesdas, at 21.4% [3].

A 40% reduction in stunting is one of the targets of the Sustainable Development Goals (SDGs), which all countries are expected to achieve globally by 2025 [4]. This policy aims to decrease the prevalence of stunting in Indonesia to 14.9% by 2025 [5]. According to Presidential Regulation No. 72 of 2021, concerning the Acceleration of Stunting Reduction, the President has set a target to reduce the prevalence of stunting to 14% by 2024 [5]. Stunting occurs due to various factors, including household and family factors, inadequate food supply, breastfeeding issues, infectious diseases, and socioeconomic factors. Household factors include maternal factors and the home environment. Factors contributing to inadequate food supply include low food quality, insufficient food availability, and inadequate access to water. Socioeconomic factors include political stability, poverty, employment, health, access to health services, and socio-cultural factors [6]

Socioeconomic conditions of underprivileged families are associated with difficulties in providing children with nutritional intake, access to health, access to sanitation, and clean water, thus inhibiting children's growth and development. A longitudinal study in Nepal showed that children from poor households were 1.8 times more likely to experience stunting than children from wealthy families [7]. Economic and educational inequality in lower-middle-income countries causes significant disparities in nutritional status in children and triggers an increase in the incidence of stunting [7].

METHODS

This study employs an observational cohort design. In a cohort study, risk factors and the effects of past diseases are measured using historical records. This study utilizes historical records from secondary data collected by the Sleman HDSS (Health Demographic Surveillance System) in cycles 4 and 5, spanning the period from 2018 to 2019. The HDSS Cycle 4 study was conducted from February 26 to May 16, 2018, and Cycle 5 was conducted from March 4 to May 29, 2019. In cycle 4 of 2018, respondents who could not be visited in three consecutive data update cycles were replaced with new respondents (refreshment sample). The instrument used in this study was a questionnaire, administered during HDSS cycles 4 and 5. Variable creation is based on operational definitions, which involve organizing data into tables adjusted to dummy tables. This analysis encompasses descriptive, bivariate, and multivariable analyses.

The variables in this study were determined based on the background, literature review, and availability of data sets in HDSS cycles 4 and 5. The variables in this study were divided into three groups: 1) dependent variables; 2) independent variables; and 3) external variables. The dependent variable was babies born stunted, based on the HDSS cycle five survey. The independent variable was the status of underprivileged families, as determined by the HDSS Cycle 4 survey. External variables: a) parental education; b) history of the baby's birth weight; c) mother's age; d) mother's job; e) father's occupation; f) location of residence; g) midwife assistant; and h) gender.

Data analysis was conducted using STATA version 17.0. Data analysis was conducted descriptively, including bivariate and multivariable analyses. Bivariate analysis using the chi-square test, which has an expected count > 5, and the exact Fisher test if the expected count < 5, with a 95% confidence level and $\alpha = 0.05$. The requirement to perform a Chi-Square test is that the lowest expected count is five. If the predicted count has been met, the next step is to determine the ρ value. If the ρ value is less than 0.05, then the null hypothesis (H0) is rejected. After obtaining the ρ value, the next step is to find the relative risk (RR) value. The null hypothesis is rejected if the confidence interval value is not one. Multivariable analysis using logistic regression with a significance level of $p > 0.25$.

RESULTS

Based on the inclusion and exclusion criteria, 168 respondent babies were included in this study. Table 1 shows the descriptive analysis of respondent characteristics, which revealed that one-third of respondents (31.5%) were residents with a pre-prosperous economic status. Most respondents (71.4%) were not stunted, and were male (53%). The majority of respondents (69.6%) completed their last education at the secondary level. Most of the respondents' mothers were unemployed (45.2%), while their fathers were predominantly non-formal workers. More than three-quarters of respondents lived in villages, and the majority of birth attendants were obstetricians (66.7%).

Table 2 presents the results of the bivariate analysis, indicating that the RR value for pre-prosperous families was 1.72 times that of wealthy families. Middle-class families were 1.15 times, which shows that babies born to pre-prosperous families are at 1.72 times risk of being born stunted compared to babies born to wealthy families. Babies will be at 1.15 times the risk of being born stunted if they are born to middle-class families compared to wealthy families. Mothers who give birth as teenagers are at 1.53 times the risk of giving birth to stunted babies compared to mothers who give birth as adults. Based on education, mothers with higher education are at 1.2 times the risk of giving birth to stunted babies compared to mothers with low education, and mothers with secondary education are at 1.94 times the risk of giving birth to stunted babies compared to mothers with low education. Mothers who act as housewives or do not work are at 1.8 times the risk of giving birth to stunted children compared to mothers who work informally, and mothers who work formally are at 1.2 times the risk compared to mothers who work informally. Unemployed fathers are at 2 times the risk of having a stunted birth compared to fathers who are employed or whose jobs are unknown. Meanwhile, fathers who work formally are at 1.2 times risk of having a stunted birth compared to fathers who are alpha or whose jobs are unknown, and fathers who work informally are at 1.08 times risk of having a stunted birth compared to unknown fathers (Table 2).

In this analysis, it is known that female babies tend to have a stunted birth with a risk of 1.2 times compared to babies who are born male sex. Babies born in cities are at 1.26 times the risk of being stunted compared to babies born in rural areas. Babies born with low birth weight (<2500 grams) are at 3.97 times the risk of being stunted compared to babies born with sufficient birth weight (≥2500 grams). Babies who a doctor assists during delivery are at 1.21 times the risk of being born stunted compared to babies who a midwife assists during delivery (Table 2). The multivariable analysis found that reporting stunted events was more common in babies born with low birth weight (95% CI = 6.39-712.6). After three modeling sessions, the significant influencing factor was the baby's birth weight, with a 95% CI of 4.79-328.2 (Table 2).

Table 1. Characteristics of respondents based on wealth index

Variables	Total n (%)	Rich n (%)	Middle n (%)	Underprevileged n (%)	p-value
Total	168 (100)	32 (19.1)	83 (49.4)	53 (31.5)	
Dependent variable					
Baby at birth					
Stunted	48 (28.6)	7 (21.9)	21 (25.3)	20 (37.7)	0.190
Not stunted	120 (71.4)	25 (78.1)	62 (74.7)	33 (62.3)	
Outer variable					
Gender					
Male	89 (53.0)	15 (46.9)	45 (54.2)	29 (54.7)	0.740
Female	79 (47.0)	17 (53.1)	38 (45.8)	24 (45.3)	
Mother age (years)					
Adult (> 20)	161 (95.8)	32 (100.0)	78 (94.0)	51 (96.2)	0.340
Adolescent (≤ 20)	7 (4.2)	0 (0.0)	5 (6.0)	2 (3.8)	
Mother education					
Low	6 (3.6)	0 (0.0)	5 (6.0)	1 (1.9)	<0.001
Middle	117 (69.6)	9 (28.1)	59 (71.1)	49 (92.5)	
High	45 (26.8)	23 (71.9)	19 (22.9)	3 (5.7)	
Mother's job					
Formal worker	52 (31.0)	17 (53.1)	25 (30.1)	10 (18.9)	0.024
Non-formal worker	40 (23.8)	5 (15.6)	19 (22.9)	16 (30.2)	
Housewife	76 (45.2)	10 (31.3)	39 (47.0)	27 (50.9)	
Father's job					
Formal worker	62 (36.9)	18 (56.3)	31 (37.3)	13 (24.5)	0.021
Non-formal worker	70 (41.7)	7 (21.9)	34 (41.0)	29 (54.7)	
Unemployed	4 (2.4)	0 (0.0)	1 (1.2)	3 (5.7)	
Alpha	32 (19.0)	7 (21.9)	17 (20.5)	8 (15.1)	
Location					
Rural	142 (84.5)	28 (87.5%)	71 (85.5)	43 (81.1)	0.690
Urban	26 (15.5)	4 (12.5%)	12 (14.5)	10 (18.9)	
Birth weight					
Low birth weight (< 2500 g)	13 (7.7)	0 (0.0)	7 (8.4)	6 (11.3)	0.160
Normal birth weight (≥ 2500 g)	155 (92.3)	32 (100.0)	76 (91.6)	47 (88.7)	
Birth assistant					
Doctor	112 (66.7)	26 (81.3)	55 (66.3)	31 (58.5)	0.097
Midwife	56 (33.3)	6 (18.8)	28 (33.7)	22 (41.5)	

Table 2. Bivariate and multivariable analysis

Variables	Stunted	Not stunted	Total	RR (95% CI)	p-value
	n (%)	n (%)	n (%)		
Wealth index					
Upper wealth quintile	7 (14.58)	25 (20.83)	32 (19.05)	1	0.190
Middle wealth quintile	21 (43.75)	62 (51.67)	83 (49.40)	1.15 (0.54-2.45)	
Lower wealth quintile	20 (41.67)	33 (27.50)	53 (31.55)	1.72 (0.82-3.61)	
Mother age (years)					
Adolescent (≤ 20)	45 (93.75)	116 (96.67)	161 (95.83)	1	0.390
Adult (> 20)	3 (6.25)	4 (3.33)	7 (4.17)	1.53 (0.62-3.37)	
Mother education					
Low	1 (2.08)	5 (4.17)	6 (3.57)	1	0.230
Middle	38 (79.17)	79 (65.83)	117 (69.64)	1.94 (0.32-11.80)	
High	9 (18.75)	36 (30)	45 (26.79)	1.2 (0.18-7.88)	
Mother's job					
Non-formal worker	8 (16.67)	32 (26.67)	40 (23.81)	1	0.090
Formal worker	12 (25.00)	40 (33.33)	52 (30.95)	1.2 (0.52-2.55)	
Housewife	28 (58.33)	48 (40.00)	76 (45.24)	1.8 (0.92-3.65)	
Father's job					
Alpha	8 (16.67)	24 (20.00)	32 (19.05)	1	0.720
Unemployed	2 (4.17)	2 (1.67)	4 (2.38)	2 (0.63-6.31)	
Formal worker	19 (39.58)	43 (35.83)	62 (36.90)	1.2 (0.60-2.47)	
Non-formal worker	19 (39.58)	51 (42.50)	70 (41.67)	1.08 (0.53-2.21)	
Gender					
Male	23 (47.92)	66 (55.00)	89 (52.98)	1	0.406
Female	25 (58.02)	54 (45.00)	79 (47.02)	1.22 (0.75-1.97)	
Location					
Rural	39 (81.25)	103 (85.83)	142 (84.52)	1	0.450
Urban	9 (18.75)	17 (14.17)	26 (15.48)	1.26 (0.69-2.27)	
Birth weight					
Normal birth weight) (≥ 2500 gr)	36 (75.00)	119 (99.17)	155 (92.26)	1	<0.000
Low birth weight (< 2500 gr)	12 (25.00)	1 (0.83)	13 (7.74)	3.97 (2.86-5.51)	
Birth assistant					
Midwife	14 (29.17)	42 (35.00)	56 (33.33)	1	0.460
Doctor	34 (70.83)	78 (65.00)	112 (66.67)	1.21 (0.71-2.06)	

RR (Relative Risk); CI (Confidence Interval)

DISCUSSION

Risk of underprivileged families experiencing stunted births

Based on the results of data collection in this study, the proportion of stunted babies was 28.6%, it was [8] stated that stunted cases in Sleman Regency decreased every year, in 2015 it was 12.86%, in 2016 it was 11.88%, in 2017 it was 11.99%, in 2018 it was 11%, and in 2019 it was 8.38%. The results of further analysis in this study indicated that most respondents came from middle-class families (49.4%), while the remaining 19% came from wealthy families, and 31.5% of respondents came from underprivileged families. The results of the analysis show that disadvantaged families are at risk of experiencing stunting at birth by 1.72 times compared to prosperous families. The results of this study align with those from other research [9], indicating that social status has a significant relationship with the incidence of stunting.

The results of this study align with those of previous research, which shows that socioeconomic status and food diversity are significantly correlated with the incidence of stunting in toddlers within the Wilangan Health Center's work area in Nganjuk Regency [10]. The results of this study align with those of research [11], indicating that family welfare, particularly the income of the father and mother, influences the incidence of stunting.

The results of the study [12] also indicate that economic and social factors have a significant impact on the incidence of stunting. Another research also succeeded in proving a significant relationship between stunting and poverty [13]. Habyarimana et al. (2016) demonstrated a relationship between family welfare and the incidence of malnutrition, which in turn triggers the incidence of stunting [14]. Furthermore, stunting occurs a lot in PKH families [12]. The World Food Programme WFP also shows that stunting is often found in low-income families [15].

Risk of external variables with stunted babies

The results of this study's analysis indicate a significant relationship between baby weight and the incidence of stunting. The results of the analysis show that most babies with birth weight <2500 g experience stunting, while babies with birth weight ≥ 2500 g tend not to be stunted. The results of this study align with those of research [16], which indicates a significant relationship between baby weight and the incidence of stunting. The results of this study are also in line with those of research [17], which shows that low birth weight can be a risk factor for stunting. The study by Hapsari et al. (2022) also reveals that baby weight is a factor influencing the incidence of stunting [18]. Birth weight is a factor that significantly influences the incidence of stunting [19-25].

The results of the analysis in this study indicate that there is no significant relationship between maternal age and the incidence of stunting, the results of the analysis show no tendency for stunting to occur in infants with mothers aged <20 years or infants with mothers aged ≥ 20 years, however, in young mothers there is a risk of giving birth to stunted babies 1.53 times greater than mothers who give birth in adulthood. The number of stunted infants in mothers aged <20 years is 3.33%, which is significantly different from the number of stunted infants in mothers aged ≥ 20 years (96.67%). However, there is a phenomenon where the tendency is not significant; the incidence of stunting cannot be predicted from the mother's age. The results of this study align with those of research [26], indicating that the mother's age does not significantly influence the incidence of stunting. Instead, stunting is more closely associated with the mother's education, family income, and knowledge.

The results of the analysis in this study indicate that there is no significant relationship between gender and the incidence of stunting. The results of the analysis show no tendency for stunting to occur in male or female babies; the number of stunted male babies is 13.69%, which is not significantly different from the number of stunted female babies (15.48%). The results of this study align with the findings of research [27] that indicate no significant relationship between gender and the incidence of stunting. The results of this study align with those of research by Nuraeni & Suharno (2020), indicating that gender does not influence the incidence of stunting [28]. Instead, stunting is associated with the length of birth, maternal age, maternal education, and birth weight. The results of this study align with those of research, which also indicates that gender is not a significant factor influencing the incidence of stunting [29]. The results of the study [30] also show that gender, birth weight, history of exclusive breastfeeding, and history of infectious diseases are not related to the incidence of stunting in toddlers with a p-value> 0.05.

According to the bivariate analysis results, female babies are 1.2 times more likely to be stunted at birth. In contrast, Rwanda reports that male children are 1.5 times more likely to be stunted [31]. Biologically, boys tend to have a weaker body when they are born compared to girls, so that boys are more susceptible to infectious diseases that result in decreased appetite. Decreased digestive function requires more energy. However, the process of increasing food consumption in sick children is complex, which can affect their nutritional status, potentially leading to optimal or even decreased levels [32].

The results show a p value test of 0.23, therefore the p value> 0.05 it is concluded that there is no significant relationship between maternal education and the incidence of stunting and based on the risk results it shows that mothers with secondary education have a 1.9 times risk of giving birth to stunted children compared to mothers with low education, the results of the analysis show no tendency for stunting in infants with maternal education. The results of this study align with those of Shodikin et al. (2023), indicating that maternal education level and nutritional parenting patterns are not associated with the incidence of stunting in toddlers [33]. The Sragen Health Office and Gemolong Health Center aim to enhance nutritional parenting practices among mothers of toddlers, thereby preventing future stunting caused by inadequate dietary habits.

The results of this study align with those of Saputri (2022), indicating no relationship between maternal education and stunting incidence [34]. A relationship was found between the frequency and duration of infectious diseases (diarrhea and acute respiratory infections, or ARI) and the incidence of stunting in toddlers aged 24-59 months in Tepisari Village, Polokarto, Sukoharjo [34]. The results of the study [35] also showed that the level of education and exposure to information were not related to knowledge about stunting in Sukamulya Village, Bandung Regency. Community knowledge can be improved through the provision of health education interventions. Another study [36] that showed consistent results also found that maternal education was not a factor in stunting. The results of the analysis in this study indicate that there is no significant relationship between fathers' work and the incidence of stunting. The analysis reveals no significant difference in stunting incidence between formal and non-formal workers. However, the results show that fathers who work as formal workers have a higher incidence of stunting. The analysis results indicate no significant relationship between the mother's work and the incidence of stunting. Furthermore, the results show no tendency for stunting incidence in infants of mothers who do not work, formal workers, or non-formal workers. The results of this study align with those of previous studies [25,37,38], indicating that the type of work factor is not among the factors influencing the incidence of stunting.

The results of the analysis in this study indicate that there is no significant relationship between the assisting physician and the incidence of stunting. The results of the analysis show no tendency for stunting to occur in infants assisted by obstetricians, general practitioners, or midwives; in fact, the highest number of stunting events is observed in deliveries assisted by obstetricians. The results of this study align with those of previous studies [39-41], indicating that the role of the delivery assistant is not a factor in stunting.

CONCLUSION

Based on multivariable modeling, babies born to underprivileged families have a higher risk of being stunted, but this is not statistically significant. The same model shows that other variables that increase the risk of babies being born stunted are LBW. The government, particularly the Sleman Regional Government, is advised to prioritize the success of poverty alleviation programs, thereby enhancing the welfare of underprivileged families and promoting family welfare, especially for disadvantaged families. Daily food nutrition will also increase, which, in the long term, can slowly reduce the risk of stunting in each family. Further research is expected to be carried out by expanding the research location to determine the factors contributing to stunting in several areas, which can then be used as a reference for overcoming the incidence of stunting in various regions of Indonesia.

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