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Determinant Factors of Short Birth Length Baby as a Risk Factor of Stunting in West Java

Faktor Determinan Panjang Badan Bayi Lahir Pendek sebagai Faktor Risiko Stunting di Jawa Barat

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ABSTRACT

Background: Short birth length is one of the predictors of stunting.
Objectives: This study aimed to examine birth length's determinants, which are risk factors for stunting in later life.
Methods: Analytical observational study with a cross-sectional approach used secondary data from the Indonesia Nutrition Status Survey (SSGI) in 2021. The population was households representing 33 provinces. The study sample was the babies recorded in the 2021 SSGI study in the West Java census block, with as many as 7,112 babies. The data collected were the birth length of the baby, factors when the mother was pregnant with the baby such as the mother's age, place of residence, mother's education level, occupation, ownership of JKN/Jamkesda, ever received blood supplement tablets, place of delivery, birth attendant, possession of a prosperous family card, social welfare economy, and several family members. Data were analyzed by bivariate and multivariate. The eligible variables were analyzed by multiple logistic regression tests with a significance level of $p<0.05$.
Results: The results of the multivariate analysis showed that the factors affecting the length of the child's body at birth were the ownership of health insurance (JKN) and the acceptance of blood supplement tablets (TTD). The study found that mothers who did not have health insurance (JKN) were at risk for giving birth to babies with a short body length of 4.526 times. Mothers who received blood supplement tablets were 0.196 times less likely to have a baby with short body length than mothers who had never received blood supplement tablets.
Conclusions: Factors that affect short birth length are JKN/Jamkesmas ownership and acceptance of blood supplement tablets. It is recommended that specific nutrition interventions be continued through the provision of blood supplement tablets and sensitive nutrition interventions through health insurance programs in prevention.

INTRODUCTION

Stunting is the most common chronic malnutrition in the world. The prevalence of under-five-stunting in Indonesia decreased from 27.7% in 2019 to 24.4% in 2021. Even so, the prevalence of stunting is still far from the target set by the government, which is 14% in 2024[1,2]. According to the 2018 Indonesian Basic Health Research (Riskesdas), the prevalence of under-five stunting in West Java Province is 31.1%. This number is higher than the national stunting prevalence[3]. Meanwhile, according to the 2019 Toddler Nutrition Status Study, the prevalence of stunting decreased to 26.21%[1]. In 2021, the results of the Indonesian Nutritional Status Study (SSGI) show that the prevalence of stunting will decrease again to 24.5%. The decline in the prevalence of stunting in West Java from 2019 to 2021 is still less than 2%[2].

Stunted children experience growth failure in physical, cognitive, and other intelligence. Previous research has shown a link between stunting in infancy with low academic achievement in adolescence, a high body mass index (BMI), and a higher risk of non-communicable diseases in adulthood[4]. Another review states that height based on age (H/age two predicts human resources quality of human resources. This indicator is related to chronic diseases in adulthood, which are more common in children who experience malnutrition[5]. Several studies also state that stunting in children will continue to the next generation (intergenerational effect). The early golden period of a

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child's life is critical to achieving the health, growth, and development of the nation's generation[6].

The West Java Provincial Government has made various efforts to accelerate stunting reduction to achieve zero new stunting. One of the things that must be considered to achieve zero new stunting is to avoid infants born from stunting risk factors. Infant birth length <48 cm (short) is a risk factor for toddler stunting. Infants born with short body lengths have four times the risk of becoming stunted at three months and double at two years[7]. Children born with short body lengths tend to have difficulty keeping up with average growth, which results in a shorter stature than adults. A study showed that children with shorter birth lengths are three times more likely to experience stunting and also experience developmental delays after controlling for other factors[8].

Research on short birth length has not been carried out precisely. Body length at birth is an indicator of birth outcome, which is a predictor of the growth and survival of the baby in the future[9]. It is essential to measure the birth length at birth to help understand when a stunting prevention program should be carried out, whether during pregnancy, breastfeeding, or the period of complementary feeding, to reduce the prevalence of stunting and prevent growth retardation in the future.

Information on the factors that influence birth length is still limited[9]. One study showed that infants boys are likelier to be born shortly than baby infant[10]. The longer gestational duration was also found to have a significant positive relationship with the baby's length at birth[11]. Meanwhile, research in Ethiopia showed that stunting was related to gender, pregnancy season, and birth weight[12]. Understanding the factors that affect short births can prevent the risk of stunting and growth retardation in the future. Therefore, this study aimed to examine birth length's determinants, which are risk factors for stunting in later life.

METHODS

This study used analytic observational with a cross-sectional approach with secondary sources data from the 2021 Indonesian Nutrition Status Survey (SSGI) organized by the Indonesian Ministry of Health's Health Research and Development Agency. The dependent variable in this study was the baby's body length. In contrast, the independent variable in this study was various factors when the mother was pregnant with the baby, such as the mother's age, place of residence, mother's education level, mother's occupation, ownership of National Health Insurance (JKN/Jamkesda), ever received iron supplement tablets, place of delivery, delivery assistance, possession of a prosperous family card, socioeconomic status, and several family members. The population in SSGI 2021 is all ordinary households representing 33 provinces. While the sample in this study were babies recorded in the SSGI 2021 study in the West Java census block area who were alive at the time of the SSGI 2021 interview, totaling 7112 babies. The research data was coded and cleaned prior to bivariate and multivariate analysis. A bivariate test in simple logistic regression was conducted to test the relationship between the independent and dependent variables. Variables that show p<0.25, then these variables will be included in the multivariate analysis in the form of multiple logistic regression tests. The relationship was considered statistically significant in the multivariate analysis of p<0.05. The research was conducted after receiving a formal ethical statement from the Research Ethics Committee of Padjadjaran University with No. 462/UN6.KEP/EC/2022.

RESULTS AND DISCUSSION

The following is a table of characteristics of the research sample on the determinants of short birth length as a risk factor for stunting in West Java. The number of respondents obtained from SSGI secondary data in this study was 7,112 mothers and their children. Table 1 shows the prevalence of short births at 19.4%. More than half of mothers (79.9%) gave birth in the age range of 20-35 years. Meanwhile, only 303 (4.5%) women were pregnant at the age of <19 years. Judging from the residence characteristics, most of the subjects lived in urban areas (80.6%). Based on the education category, more than half of mothers completed elementary and junior high school education (51.4%). The number of mothers who completed their education at junior high school was 2,450 people (34.4%). Most mothers did not work as many as 5,502 (77.4%), while mothers who worked in the private sector had 1,134 (16%). Most subjects (63, 5%) have health insurance for health facilities and receive iron tablets (87.7%). Most mothers (95%) gave birth assisted by health personnel. The ownership index quintile that describes socioeconomic status shows that almost a fifth of subjects (23.3%) are at the highest level and only 14.3% at the lowest level.

Length at birth is a crucial birth outcome indicator of the prenatal environment and a predictor of infant growth and survival. The prevalence of short-birth babies in this study was 19.4%. Previous research in Indonesia showed higher prevalence results, 23.4% and 22.9%, respectively[13,14]. Different results are possible because previous studies were taken in 2017 and 2019. The prevalence of short-birth babies is also lower compared to the results of basic health research, which shows a proportion of 20.2% in 2013 and 22.7% in 2018[3,15].

Babies with short birth lengths (<48 cm) quadrupled and doubled were stunted at three months and two years of age[7,16]. One study in Indonesia in 2021 showed that babies with short body lengths had a 5.06 times greater chance of experiencing stunting and delays in child development[17]. This finding shows that birth length is significantly related to child growth and development. The percentage of short birth lengths with abnormal growth and development is more significant (66.7%) than those with normal birth lengths (33.8%)[8]. Stunted children can fail to achieve motor development because they lack curiosity about the environment. In addition, stunted children will also affect the mechanical ability of the muscles due to obstacles to the process of maturing the muscles[18]. Children with a minimum birth length of 48 cm can also survive longer than children born under 48 cm. This condition emphasizes the importance of adequate nutrition for the fetus during pregnancy to give birth to children with good nutritional status[19].

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Table 1. Characteristics of the sample determinant factors for short birth length as a risk factor for stunting in West Java

	Sample Characteristics	Frequency (n)	Percent (%)
Birth length	Short (<48cm)	1,380	19.4%
	Normal (>=48 cm)	5,733	80.6%
Mother's Age at Birth (years)	<=19	303	4.5%
	20-35	5,356	79.9%
	>35	1,047	15.6%
Residence	Urban	5,730	80.6%
	Rural	1,383	19.4%
Mother's Education Level	No school	37	0.5%
	Did not finish elementary school	125	1.8%
	Graduated from Elementary and Middle School	3,655	51.4%
	Graduated from high school	2,450	34.4%
	College Graduate	845	11.9%
Work	Does not work	5,502	77.4%
	School	7	0.1%
	Civil Servants (PNS)/Indonesian National Army (TNI)/ Indonesian National Police (Polri)/ State-owned enterprises (BUMN)	86	1.2%
	Private employees	624	8.8 %
	Self-employed	510	7.2%
	Farmer/farm laborer	24	0.3%
	Housekeeper/Assistant	111	1.6%
	Other	247	3.5%
Ownership of National Health Insurance (JKN/Jamkesda)	Yes	4,518	63.5%
	No	2,580	36.3%
	Do not know	14	0.2%
Have you ever received a blood supplement tablet?	Yes	6,200	87.7%
	No	819	11.6%
	Do not know	47	0.7%
Birthplace	Hospital	1,007	29.2%
	Maternity clinic	754	21.9%
	Public health center	420	12.2%
	Auxiliary Health Center (Pustu)	25	0.7%
	Health practice	879	25.5%
	Village Health Post (Polindes/poskesdes)	33	1.0%
	House	320	9.3%
	Other	8	0.2%
Birth helper	Health workers	3,273	95%
	Not health workers	166	4.8%
	Not both	6	0.2%
Receive a Prosperous Family Card	Yes	1,217	17.1%
	No	5,894	82.9
Ownership index quintile	Level 1 (lowest)	1,020	14.3%
	Level 2	1,385	19.5%
	Level 3	1,429	20.1%
	Level 4	1,623	22.8%
	Level 5 (highest)	1,654	23.3%

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Table 2. Determinants of body length for short birth infants in West Java

Variable	Birth Length		COR (95%CI)	p-values	AOR (95% CI)	p-values
	Short n (%)	Normal n (%)				
Mother's Age at Birth (years)						
<=19	67 (1.0%)	236 (3.5%)	1.171 (0.858-1.598)	0.320	1.197 (0.871-1.645)	0.269
20-35	1,020 (15.2%)	4,336 (64.7%)	1.212 (0.917-1.603)	0.177	1.205 (0.904-1.606)	0.203
>35	205 (3.1%)	842 (12.6%)	Ref			
Residence						
Urban	1,130 (15.9%)	4,600 (64.7%)	1.113(0.956-1.295)	0.167	1.171 (0.993-1.381)	0.061
Rural	250 (3.5%)	1,133 (15.9%)	Ref			
Mother's Education Level						
No school	7 (0.1%)	30 (0.4%)	1.063 (0.452-2.5)	0.888	1.077 (0.437-2.652)	0.873
Did not finish elementary school	27 (0.4%)	98 (1.4%)	0.982 (0.423-2.280)	0966	0.957 (0.393-2.327)	0.922
Graduated from Elementary and Middle School	752 (10.6%)	2,903 (40.8%)	0.852 (0.368-1.974)	0.709	0.771 (0.318-1.868)	0.564
Graduated from high school	449 (6.3%)	2,001 (28.1%)	0.814 (0.318-2.081)	0.667	0.670 (0.250-1.798)	0.427
College Graduate	145 (2%)	700 (9.8%)	ref			
Work						
Does not work	1,080 (15.2%)	4,422 (62.2%)	ref			
School	1 (0%)	6 (0.1%)	0.810 (0.458-1.433)	0.469		
Civil Servants (PNS)/Indonesian National Army (TNI)/ Indonesian National Police (Polri)/ State-owned enterprises (BUMN)	17 (0.2%)	69 (1.0%)	0.746 (0.267-2.084)	0.576		
Private employees	118 (1.7%)	506 (7.1%)	0.906 (0.607-1.352)	0.628		
Self-employed	94 (1.3%)	416 (5.9%)	0.876 (0.594-1.291)	0.503		
Farmer/farm laborer	5 (0.1%)	19 (0.3%)	0.829 (0.444-1.549)	0.557		
RT Worker/Assistant	22 (0.3%)	89 (1.3%)	1.038 (0.149-7.236)	0.970		
Other	42 (0.6%)	205 (2.9%)	0.838 (0.597-1.176)	0.307		
Ownership of National Health Insurance (JKN)						
Yes	914 (12.9%)	3,604 (50.7%)	ref			
No	461 (6.5%)	2,119 (29.8%)	2.361 (0.785-7.098)	0.126	4,526 (1,265-16,191)	*0.020
Do not know	5 (0.1%)	9 (0.1%)	2.022 (0.674-6.067)	0.209	3,761 (1,054-13,425)	0.041
Have you ever received a blood supplement tablet?						
No	192 (2.7%)	627 (8.9%)	ref			
Do not know	3 (0.0%)	44 (0.6%)	0.308 (0.098-0.972)	0.045	0.277 (0.059-0.910)	0.034
Yes	1173 (16.6%)	5,027 (71.1%)	0.235 (0.074-0.749)	0.014	0.196 (0.084-0.652)	*0.008
Birthplace						
Hospital	254 (7.4%)	753 (21.9%)	ref			
Maternity clinic	137 (4%)	617 (17.9%)	46,810 (3,840-570)	0.003		
Public health center	64 (1.9%)	358 (10.3%)	94,397 (6,089-1463)	0.001		
Auxiliary Health Center (Pustu)	5 (0.1%)	20 (0.6%)	51,048 (4,230-616)	0.002		
Health practice	146 (4.2%)	733 (21.3%)	41,871 (2,892-606)	0.006		
Village Health Post (Polindes/poskesdes)	3 (0.1%)	30 (0.9%)	56655 (4657-689)	0.002		
House	57 (1.7%)	263 (7.6%)	45,687 (3,784-551)	0.003		
Other	7 (0.2%)	1 (0.0%)	30,031 (2,494-361)	0.007		

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Variable	Birth Length		COR (95%CI)	p-values	AOR (95% CI)	p-values
	Short n (%)	Normal n (%)				
Childbirth Helper						
Health workers	1,639 (8.5%)	2,634 (76.5%)	ref			
Not health workers	32 (0.9%)	134 (3.9%)	0.833 (0.125-5.556)	0.851		
Not both	1 (0.0%)	5 (0.1%)	1.027 (0.691-1.527)	0.895		
Receive a Prosperous Family Card						
Yes	222 (3.1%)	995 (14.0%)	ref			
No	1,157 (16.3%)	4,737 (66.6%)	1,094(0.933-1.282)	0.269	1,180 (0.995-1.401)	0.058
Ownership index quintile						
level 1 (lowest)	199 (2.8%)	821 (11.5%)	0.993 (0.815-1.208)	0941		
level 2	244 (3.4%)	1,141 (16%)	1.031 (0.845-1.257)	0.764		
level 3	302 (4.2%)	1,127 (15.8%)	0.904 (0.740-1.105)	0.325		
level 4	309 (4.3%)	1,314 (18.5%)	1.137 (0.924-1.399)	0.227		
level 5 (highest)	325 (4.6%)	1,329 (18.7%)	ref			
Number of Family members						
>4	8.5	35.6	ref			
<=4	10.9	45	1.021 (0.907-1.150)	0.728		

*statistically significant (P<0.05)

In this study, 11 variables were observed, factors in the incidence of short-born long babies. The bivariate analysis results showed that the variables for receiving iron tablets and place of delivery were statistically significant for the incidence of short births (p<0.05). Mothers who received iron tablets were 0.235 times less likely to have short-born babies than mothers who did not (p=0.014). At the same time, variables such as place of residence and JKN ownership have a p<0.25 in bivariate analysis. Based on the results of the bivariate statistical test (p<0.25) and considering the change in OR, six variables were included in the multivariate analysis. These variables are the mother's age at the time of pregnancy, place of residence, education level, JKN ownership, receipt of iron tablets, and possession of a social security card. As for the place of delivery variable, even though it has a significant level in the bivariate test, it is not included in the multivariate test because there is a large amount of missing data. The multivariate results using logistic regression showed that the variables of receiving iron tablets and JKN ownership contributed to the incidence of short births (p<0.05). The results of the multivariate analysis showed that the factors affecting the child's length at birth were JKN coverage (p=0.020) and receipt of iron supplement tablets (p=0.008). Meanwhile, the mother's age variable showed insignificant results with a p=0.269. The same result was found in a study in Ethiopia, where the mother's age did not affect the condition of short babies at birth. Other influencing factors are gender, birth weight, and the season the child is born[12].

Meanwhile, research in Indonesia showed that stunting at birth is associated with maternal age in the first pregnancy, parity, height of parents, age of parents, and gestational age. Mothers in their first pregnancy at the age of 25 years have a significant protective effect against the possibility of stunting newborns compared to younger mothers. Mothers whose first pregnancies are in the more mature age range tend to live in better sanitary conditions, have higher levels of education, have partners, and have higher socioeconomic status[20]. Meanwhile, research in Indonesia shows that stunting at birth is associated with maternal age in the first pregnancy, parity, the height of parents, age of parents, and gestational age.

Based on the study's results, it was found that mothers who did not have national health insurance (JKN) were at risk of giving birth to short babies by 4.526 times (p-value 0.020, CI 1.265-16.191). A series of intervention programs must be increased so that pregnant women remain healthy and give birth to babies with average body weight and length. One of the sensitive interventions that have been carried out is to provide health insurance[21]. Mothers with JKN can reduce economic disparities to get good health services, including pregnancy and childbirth. With the existence of JKN, pregnant women who experience risks of pregnancy and childbirth can be adequately treated at healthcare facilities. Therefore JKN ownership is recommended for pregnant women to protect the health of mothers and children. Mothers who have JKN have good access to antenatal care (ANC). A study by Simbolon (2021) showed that the coverage of pregnancy checks is negatively related to the prevalence of stunting. The higher the coverage of complete ANC, the lower the prevalence of stunting[22]. Research in Mataram, Indonesia, also showed that mothers who do not meet standard pregnancy checks have a 2.3 times risk of having stunted toddlers than mothers who receive standard pregnancy checks. The standard of antenatal care visits is four visits during

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Another factor influencing the incidence of short births is receiving iron supplementation. Mothers who received iron tablets were 0.196 times less likely to have short-born babies than mothers who had never received iron tablets (p-value=0.008, CI 0.084-0.652). Based on the 2013 Lancet, the recommended intervention program for the health sector to prevent stunting is iron supplementation in pregnant women[24]. To reduce the anemia rate, pregnant women are given 90 tablets of iron and ensure the fulfillment of nutrients according to their needs[25]. This recommendation relates to the high prevalence of anemia, which affects around 50% of pregnant women. The negative impact of anemia in pregnant women is the increased risk of perinatal death, premature birth, low birth weight, and short body length. Pregnant women who are anemic have the risk of giving birth to babies who are shorter (51.76 cm) compared to mothers who are not anemic (55.54 cm). They are also more prone to give birth to babies with lower body weight (3,048 grams) than mothers without anemia (3,615.6 grams)[26].

Anemia in pregnant women is likely to affect fetal growth. Previous studies reported that hemoglobin has an essential role in determining birth length[27]. Low hemoglobin levels in the blood can lead to a decrease in the body's oxygen supply capacity and poor placenta development. This term can affect the delivery of oxygen and nutrients from the mother to the fetus. These side effects then lead to chronic hypoxia in the fetus and insufficient nutrient intake, ultimately leading to non-optimal growth of fetal body weight and length[28]. Failure to grow and develop in toddlers is closely related to a lack of nutrient intake. Research in Nepal shows that pregnant women who consume iron and folic acid can prevent stunting in children under two years (RR = 0.86; 95% CI = 0.77-0.97). Pregnant women who consume more than 90 iron and folic acid tablets six months before delivery can reduce the risk of stunting by 23% (RR = 0.77; 95% CI = 0.64-0.92)[29,30]. Anemia can directly cause growth retardation due to lack of oxygen transferred to the placental tissue and an indirect effect of malnutrition[31,32].

Early and continuous administration of iron supplement tablets can potentially increase child growth in developing countries with high iron deficiency anemia. The results of this study can strengthen the implementation of the blood supplement administration program during pregnancy and even adolescence to prevent the birth of babies with short body lengths. Pregnant women who consume more than 90 iron and folic acid tablets six months before delivery can reduce the risk of stunting by 23% (RR = 0.77; 95% CI = 0.64-0.92)[29,30]. Anemia can directly cause growth retardation due to lack of oxygen transferred to the placental tissue and an indirect effect of malnutrition[31,32]. Early and continuous administration of iron supplement tablets can potentially increase child growth in developing countries with high iron deficiency anemia. The results of this study can strengthen the implementation of the blood supplement administration program during pregnancy and even adolescence to prevent the birth of babies with short body lengths. Pregnant women who consume more than 90 iron and folic acid tablets six months before delivery can reduce the risk of stunting by 23% (RR = 0.77; 95% CI = 0.64-0.92)[29,30]. Anemia can directly cause growth retardation due to lack of oxygen transferred to the placental tissue and an indirect effect of malnutrition[31,32]. Early and continuous administration of iron supplement tablets can potentially increase child growth in developing countries with high iron deficiency anemia. The results of this study can strengthen the implementation of the blood supplement administration program during pregnancy and even adolescence to prevent the birth of babies with short body lengths. 64-0.92)[29,30]. Anemia can directly cause growth retardation due to lack of oxygen transferred to the placental tissue and an indirect effect of malnutrition[31,32]. Early and continuous administration of iron supplement tablets can potentially increase child growth in developing countries with high iron deficiency anemia. The results of this study can strengthen the implementation of the blood supplement administration program during pregnancy and even adolescence to prevent the birth of babies with short body lengths. 64-0.92)[29,30]. Anemia can directly cause growth retardation due to lack of oxygen transferred to the placental tissue and an indirect effect of malnutrition[31,32]. Early and continuous administration of iron supplement tablets can potentially increase child growth in developing countries with high iron deficiency anemia. The results of this study can strengthen the implementation of the blood supplement administration program during pregnancy and even adolescence to prevent the birth of babies with short body lengths. Early and continuous administration of iron supplement tablets can potentially increase child growth in developing countries with high iron deficiency anemia. The results of this study can strengthen the implementation of the blood supplement administration program during pregnancy and even adolescence to prevent the birth of babies with short body lengths. Early and continuous administration of iron supplement tablets can potentially increase child growth in developing countries with high iron deficiency anemia. The results of this study can strengthen the implementation of the blood supplement administration program during pregnancy and even adolescence to prevent the birth of babies with short body lengths.

In this study, it was not possible to see the mother's nutritional status, which is one of the essential factors affecting the baby's birth length. So that in future studies, the determinants of the birth length of the baby can be examined by involving the nutritional factors of the mother during pregnancy. Existing programs and interventions still focus on low birth weight as an indicator of birth outcomes. Short birth length does not

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pose an immediate risk to the baby. However, short birth length is one of the decisive factors causing stunting in children in later life. The results of this study indicate that specific nutrition interventions through the administration of blood-boosting tablets and sensitive nutrition interventions through health insurance programs are recommended to prevent short births.

CONCLUSIONS

This study showed that the factors that affected short birth length were ownership of national health insurance (JKN/Jamkesmas) and receiving iron supplementation. The results of this study indicate that specific nutrition interventions through the administration of blood-boosting tablets and sensitive nutrition interventions through health insurance programs are recommended to prevent short births.

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This study showed that the factors that affected short birth length in West Java were JKN/Jamkesmas ownership and receipt of blood supplement tablets. The results of this study indicate that specific nutrition interventions through the administration of blood-boosting tablets and sensitive nutrition interventions through health insurance programs are recommended to prevent short births.

Conflict of Interest and Funding Disclosure

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