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# Stunting among Children under Five in the Area of Sekaran Primary Healthcare Center, Semarang City

**Mamluatul Hikmah[1]✉, Widya Hary Cahyati[1]**

[1]Public Health Science Department, Faculty of Sports Science, Universitas Negeri Semarang, Indonesia

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## Abstrak

Pada September 2022, prevalensi stunting di Puskesmas Sekaran adalah 3,27% lebih tinggi dibandingkan prevalensi stunting Kota Semarang pada September 2022 yaitu 1,61%. Penelitian ini bertujuan untuk mengetahui faktor-faktor yang berhubungan dengan terjadinya stunting pada balita berusia 0-59 bulan di wilayah kerja Puskesmas Sekaran, Kota Semarang dengan rancangan penelitian nested case-control. Penelitian yang berlangsung selama bulan September-Desember 2022 ini dilaksanakan di Puskesmas Sekaran, Kota Semarang. Data yang digunakan dalam penelitian ini merupakan data sekunder yang bersumber dari data kohort hasil operasi timbang balita bulan September 2022, data *reading diagnostic* stunting bulan September 2022, data ANC (K1) tahun 2017-2022, dan data persalinan dengan besar sampel 85 kasus dan 85 kontrol yang dianalisis secara univariat dan bivariat. Hasil uji statistik menunjukkan usia balita (p=0,009; OR=2,401), jenis kelamin (p=0,443), panjang badan lahir (p=<0,0001; OR=4,069), berat badan lahir (p=0,279), usia ibu saat hamil (p=1,000), dan urutan kelahiran (p=1,000). Sehingga dapat disimpulkan bahwa usia balita dan panjang badan lahir berhubungan secara signifikan dengan kejadian stunting.

## *Abstract*

*In September 2022, stunting prevalence at the Sekaran Primary Healthcare Center was 3.27% higher than the stunting prevalence in Semarang City in September 2022, which was 1.61%. This study aims to determine factors associated with stunting incidence among children aged 0-59 months in the Sekaran Primary Healthcare Center, Semarang City with a nested case-control study design. The research which took place in September-December 2022 was carried out at the Sekaran Primary Healthcare Center, Semarang City. The data used in this study is secondary data sourced from cohort data from weighing under-fives in September 2022, reading diagnostic stunting data in September 2022, ANC (K1) data for 2017-2022, and delivery data with a sample size of 85 cases and 85 controls were analyzed univariately and bivariately. The statistical test showed that the children's age (p=0.009; OR=2.401), gender (p=0.443), birth length (p=<0.0001; OR=4,069), birth weight (p=0.279), mother's age during pregnancy (p=1.000), and birth order (p=1.000). So it can be concluded that children's age and birth length are significantly associated with the incidence of stunting.*

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✉ Correspondence Address:
F5 FIK Building UNNES, Sekaran Campus
District Gunungpati, Semarang City, Central Java 50229
E-mail: mamluatulhikmah@students.unnes.ac.id

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## INTRODUCTION

Stunting is a condition in which children under five years old (0-59 months) have less height or body length when compared to age, namely having a height-for-age z-score below minus two standard deviations from the WHO median standard (Kemenkes RI, 2018). Identification of stunting is done by assessing the supine body length in children aged less than two years and standing height in children aged more than two years, then comparing the measurement results with acceptable standard values to interpret the results. An international agreement states that if the z-score results from measurements of body length or height for the same age and sex (length/height-for-age) are below minus two standard deviations (<-2 SD) from the WHO child growth standard median, then the child is called stunted. Then, if the z-score value of the child's body length or height for the same age and sex (length/height-for-age) is below minus three standard deviations (<-3 SD) of the median of WHO child growth standards, then the child will be called severe stunted (de Onis, 2016). The z-score value for height or length for age used to diagnose stunting is obtained by subtracting the median value according to age and sex from a standard population and then dividing it by the standard deviation of the population standard (Leroy, 2019).

Stunting often starts when the child is still in the womb until the first 2 years after the child is born (de Onis, 2016). It is stated that 70% of stunting occurs when a child is in a critical window period (aged 0-23 months) and continues until the child is 5 years old due to continuous exposure to unfavorable environmental factors (Leroy, 2014). This health problem which is characterized by chronic growth and development disorders occurs in one in four children under five in the world (UNICEF, 2019). Globally, in 2018 as many as 21.9% of children under five suffer from stunting (UNICEF, 2019). Although not significant, in 2019 there was a decrease in the percentage of global stunting to 21.3% (UNICEF, 2020), then it increased in 2020 to 22% (UNICEF, 2021).

Based on WHO stunting prevalence data, in the Southeast Asia region, Indonesia is the third country with the highest prevalence of stunting with an average prevalence of stunting under five from 2005 to 2017 of 36.4% (Kemenkes RI, 2018). Based on the 2019 SSGBI (*Studi Status Gizi Balita di Indonesia*) the prevalence of stunting in 2019 among children under five in Indonesia was 27.67% (Kemenkes RI, 2019). Then, based on the results of the 2021 SSGI (*Studi Status Gizi Indonesia*) this figure has decreased to 24.4% (Kemenkes RI, 2021). Even though it has decreased, the prevalence of stunting in Indonesia is still above the stunting prevalence threshold for developing countries set by WHO, which was 20%.

Based on the 2021 SSGI, the prevalence of stunting among children under five in Central Java Province is 20.9% (Kemenkes RI, 2021). It's much smaller when compared to the prevalence of stunting in children under five in Central Java Province in 2019 which was 27.2% (Kemenkes RI, 2019). Meanwhile, Semarang City, which is part of Central Java Province, based on data from the results of weighing operations (children under-five weighing months) issued by the Semarang City Health Office in 2019 had a prevalence of stunting among children under five of 2.57%. The prevalence of stunting among under-five children in Semarang City increased in 2020 to 3.13%, and although it was not significant, it decreased in 2021 to 3.10% (DKK Semarang, 2022). The Sekaran Primary Healthcare Center, which is one of the primary healthcare centers (PHC) in Semarang City, based on data from children under five weighing operations in September 2022, had children under five stunting prevalence of 3.27%. This figure is much higher when compared to the children under five stunting prevalence in Semarang City in the same month and year, which was 1.61%.

Stunting that occurred among children under five had a negative impact in the short and long term. Stunting that occurs when children are aged 1 to 6 months and continues until they are 60 months old is known to affect

the low cognitive development of the children (Alam, 2020). Ekholuenetale (2020) adds that children who are stunted will experience a decrease in cognitive development by as much as 7% compared to children who are not stunted. Stunting will cause delays in child development, increase the risk of morbidity and mortality, reduce children's learning ability, increase the risk of infectious diseases and contagious diseases, as well as susceptibility to hypertension, diabetes mellitus, obesity, and dyslipidemia. In adulthood, the occurrence of stunting will also affect performance in the work and unfavorable reproductive outcomes for mothers (Mustakim, 2022; Soliman, 2021).

Stunting among children under five is known to be closely related to several risk factors including being male, aged 12-59 months, and overweight (Vonaesch, 2017). Stunting is also related to low birth weight, short birth length, mother's height <145 cm, low mother's education, poor family economic conditions, mother's BMI <18.5 kg/m$^2$, the number of children under five in one house is more than two, and recurrent diarrhea (Berhe, 2019; Nshimyiryo, 2019; Utami, 2018). Then, mother's age during pregnancy, premature birth, and mother's chronic malnutrition during pregnancy were also related to the occurrence of stunting (Gonete, 2021; Sari, 2021). In the other studies, it was also stated that stunting is related to religion and urban area (Gebru, 2019; Rakotomanana, 2017).

Based on the study in 2016, it's known how the relationship between exclusive breastfeeding, complementary breastfeeding, birth weight, diarrhea, ARI, baby's head circumference, mother's height, allotment of parenting time, mother's education level, and family's economic level with stunting among children aged 6 months in Semarang City (Mustikaningrum, 2016). Then, based on study in 2019, it's known how the relationship between parity, mother's education level, mother's occupation status, number of children, gender, birth length, mother's height, order of children, *Posyandu* participation, exclusive breastfeeding, family income, health status, immunization completeness status, housing conditions, mother's knowledge, nutritional intake, and parenting style with stunting incidence among children under 2 years old in Semarang City (Cahyati, 2019). Previous study was aimed at finding out the risk factors for stunting among children aged 6 months and under 2 years. Because the prevalence of stunting in children aged 0-59 months at the Sekaran Primary Healthcare Center is still higher when compared to the prevalence of stunting in Semarang City based on the September 2022 cut-off, so this study aims to determine the factors associated with the stunting incidence among children aged 0-59 months in the Sekaran Primary Health Center. The children's age and the mother's age during pregnancy included as the variables to be studied.

## METHOD

This is an analytic observational study with a nested case-control approach. All data in this study came from secondary data. Cases and controls were determined based on cohort data on the height or body length of children produced by weighing operations every month, which in this study used the results of weighing operations in September 2022. Historical data on cases were obtained from stunting reading diagnostic results in September 2022, while historical data for controls was obtained from mother and child cohort data (ANC (K1)) in 2017-2022 and maternal delivery data in 2017-2022 at the Sekaran Primary Healthcare Center (figure 1). This research was conducted at the Sekaran Primary Healthcare Center, Semarang City in September-December 2022. The dependent variable was the incidence of stunting among children aged 0-59 months, while the independent variables were children's age, children's gender, birth length, birth weight, mother's age during pregnancy, and birth order.

The population in this study were all children aged 0-59 months in the area of Sekaran Primary Healthcare Center, Semarang City who participated in the weighing

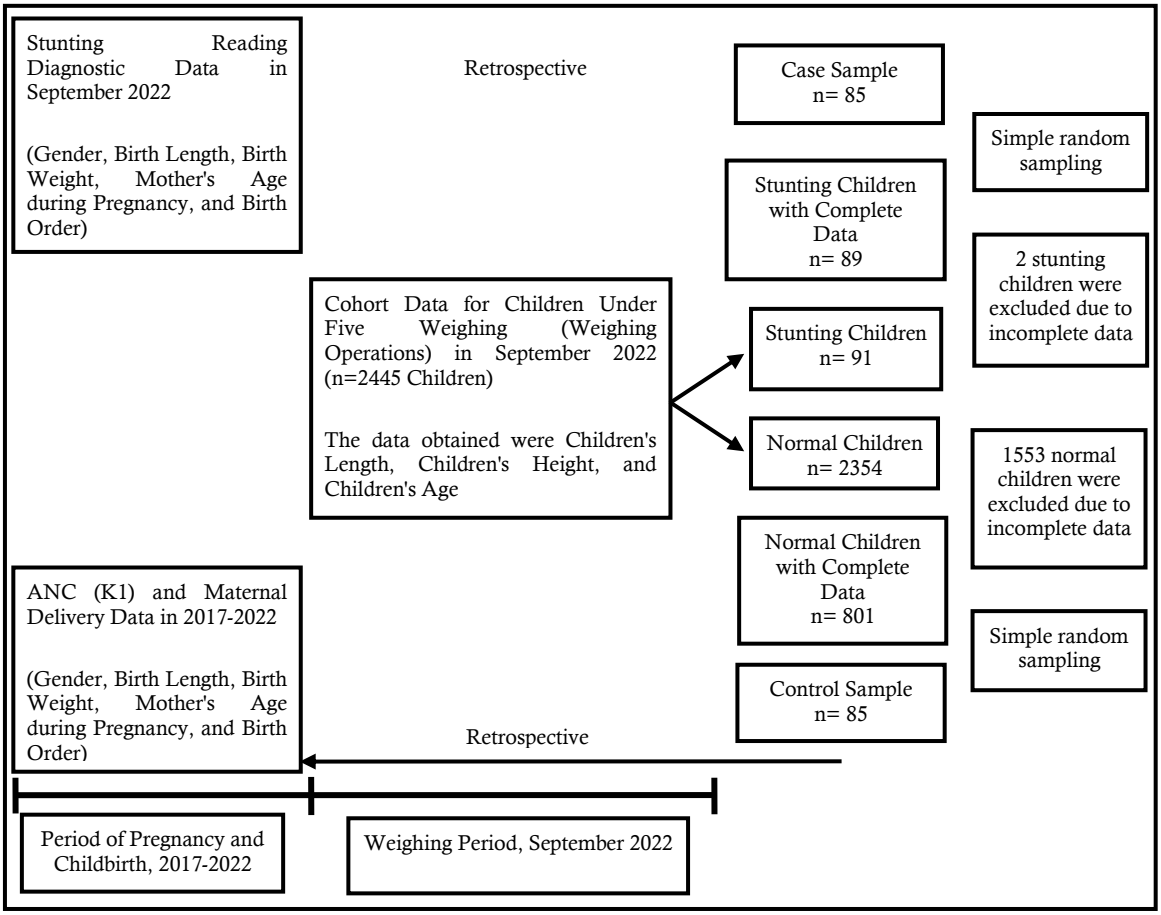


**Figure 1.** Nested Case-Control Design for Stunting Incidence among Children Aged 0-59 Months in the Area of Sekaran Primary Healthcare Center, Semarang City, 2022

operation in September 2022, totaling 2445 children under five. The samples included in this study were samples that met the inclusion and exclusion criteria which were taken by simple random sampling. The inclusion criteria were children aged 0-59 months who attended weighing operations and had their height or length measured in September 2022 at the Sekaran Primary Healthcare Center, Semarang City. Meanwhile, the exclusion criteria were children aged 0-59 months with incomplete and unclear data. The determination of sample size was carried out using the minimum sample size formula for case-control studies, so that a minimum sample of 85 cases and 85 controls was obtained. The sample in this study totaled 170 samples consisting of 85 cases, namely children aged 0-59 months who were diagnosed with stunting, i.e. those who had a measurement result of height/age or length/age less than -2 SD to -3 SD (stunted) and less from -3 SD (severely stunted) at the weighing operation in September 2022, and 85 controls, namely children aged 0-59 months who were not diagnosed with stunting, i.e. those who had measurement result of height/age or length/age of more than -2 SD at the weighing operation in September 2022.

The data in this study were analyzed univariately and bivariately to determine the significance relationship between dependent variable and independent variable and also done to see the amount of risk. Bivariate analysis was performed using the chi-square test and fisher's exact test. The relationship between dependent variable and independent variable will be called significant if the result of the p-value is <0.05 and very significant if the result of the p-value is <0.01. This research has obtained ethical approval from the Ethics Committee for Health Research, Universitas Negeri Semarang with ethical number 417/KEPK/EC/2022.

## RESULT AND DISCUSSION

The characteristics of children under five based on their age who participated in this study can be seen in Table 1. Table 1. showed that the children's age in this study were not normally distributed. The median for children's age was 27 months and the mode for children's ages was 30 months with a minimum data value of 0 months and a maximum data value of 59 months (the children's age range was 59 months). The majority of children who participate in this study were aged 24-35 months. The other characteristics of the children including gender, birth length, birth weight, mother's age during pregnancy, and birth order as well as the results of statistical tests on the relationship between the independent variables and the dependent variable can be seen in Table 2. In Table 2., there are two variables with a p-value less than 0.01, namely children's age and birth length.

There is a significant relationship between children's age and the incidence of stunting (p-value= 0.009), where based on the percentage, stunted children tended to be 24-59 months old (57%) and normal children tended to be 0-23 months old (46%). It was found that children aged 24-59 months had a 2.4 times greater risk of experiencing stunting compared to children aged 0-23 months. This result is in line with research conducted in Nepal and the Democratic Republic of Congo which states that there was a significant relationship between children's age and the incidence of stunting (Adhikari, 2019; Kismul, 2017). Compared to children aged 0-23 months, children aged 24-35 months, 36-47 months, and 48-60 months have a 2 times greater risk of experiencing stunting (Habimana, 2019).

**Table 1.** The Distribution of Sample Age Characteristics in the Incidence of Stunting among Children Aged 0-59 Months in the Area of Sekaran Primary Healthcare Center, Semarang City, 2022

| Age (Months) | n | % | Median | Mode |
|---|---|---|---|---|
| 0-11 | 20 | 11.8 | 8.50 | 10 |
| 12-23 | 54 | 31.8 | 17.50 | 15 |
| 24-35 | 55 | 32.4 | 29.00 | 30 |
| 36-47 | 24 | 14.1 | 41.00 | 42 |
| 48-59 | 17 | 10 | 53.00 | 49 |

A low height-for-age z-score at the age of more than 2 to 3 years indicates that stunting or growth failure has indeed occurred, while at the age of less than that, the lower height-for-age z-score indicates ongoing stunting conditions (Fikawati, 2017). This is related to Kemenkes RI (2018) that said, the condition of stunting including short body height compared to children of their age and developmental disorders in children will be seen after 2 years of age. After 2 years of age, children have gone through a golden period where at that time children have gone through crucial periods of growth as well as important periods for improving nutrition (Yulastini, 2022). After 2 years of age, children have become active consumers and can choose the food they like, including random snacks, without paying attention to the cleanliness of the food. This condition can increase the risk of developing infectious diseases which increases the risk of stunting in children (Pranowo, 2021).

The statistical test show that there is no significant relationship between the gender of the children and the incidence of stunting (p= 0.443 (p>0.05)), where, in terms of percentage, the incidence of stunting tends to be more in female children (45%), while normal children tend to be more in male (46%). This result is not in line with research conducted in Yemen which states that there is a significant relationship between the children's gender and the incidence of stunting (Al-Mansoob, 2018). Al-Mansoob (2018) stated that males were at 1.53 times greater risk for experiencing stunting than females. Males have larger body sizes and lower fat mass than females, so they need greater nutrition. By much greater nutritional needs, when nutritional needs are not fulfilled, males will be more susceptible to malnutrition and

stunting (Thompson, 2021). Meanwhile, this result is in line with research conducted in Ethiopia and Palestine which states that there is no significant relationship between the gender of the children and the incidence of stunting (Berhe, 2019; Gordon, 2013).

No relationship between gender and the incidence of stunting can be explained because even though male children have greater nutritional needs, if these nutritional needs can be met properly and completely, then the risk of stunting can be avoided (Anggraini, 2021). This is supported by the results of stunting reading diagnostic which shows that 70.6% of stunted children have received nutrition from exclusive breastfeeding during the first 6 months of life, 84.7% of stunted children also received complementary breastfeeding (*MP-ASI*) after 6 months of age. Based on the results of measuring the diet in one week, every day stunted children also get the consumption of foods that contain carbohydrates, protein, fat, vitamins and minerals from the consumption of vegetables and fruit. Thus, it can be stated that the majority of stunted children, both male and female, have had their nutritional needs sufficiently met.

There is a very significant relationship between birth length and the incidence of stunting among children under five (p-value= <0.0001 (p <0.01)), in which both stunted (57.6%) and normal children (84.7%) tend to be born with a body length of more than equal to 48 cm. In addition, the results of this study also show that children born with a body length of less than 48 cm have a 4 times greater risk of experiencing stunting compared to children who have a body length more than or equal to 48 cm. These results support the results of previous studies which state that there is a significant relationship between birth length and the incidence of stunting (Manggala, 2018; Utami, 2018). Birth length is a strong predictor of height in adolescence. Compared to children of their age, children born with short birth lengths tend to experience a slight increase in length or height (Salsabiila, 2021). If unable to catch up, children born with short body lengths will also have short stature when they enter adolescence (Alim, 2018). Meanwhile, an increase of 1 cm in a child's body length at birth will increase 0.7-1 cm in height as a teenager (Utami, 2018).

**Table 2.** The Relationships between Children's Age, Gender, Birth Length, Birth Weight, Mother's Age during Pregnancy, and Birth Order with Stunting Incidence among Children aged 0-59 Months in the Area of Sekaran Primary Healthcare Center, Semarang City, 2022

| No | Variable | Stunting Incidence | | | |
|---|---|---|---|---|---|
| | | **Stunting (%)** | **Normal (%)** | **p-Value** | **OR (95% CI)** |
| | Children's Age | | | | |
| 1 | 24-59 months | 57 (67.1) | 39 (45.9) | | |
| | 0-23 months | 28 (32.9) | 46 (54.1) | 0.009** | 2.401 (1.289 – 4.471) |
| | **Jumlah** | 85 (100) | 85 (100) | | |
| | Gender | | | | |
| 2 | Male | 40 (47.1) | 46 (54.1) | | |
| | Female | 45 (52.9) | 39 (45.9) | 0.443 | - |
| | **Jumlah** | 85 (100) | 85 (100) | | |
| | Birth Length | | | | |
| 3 | < 48 cm | 36 (42.4) | 13 (15.3) | | |
| | ≥ 48 cm | 49 (57.6) | 72 (84.7) | <0.0001** | 4.069 (1.960 – 8.450) |
| | **Jumlah** | 85 (100) | 85 (100) | | |

| | | | | | |
|---|---|---|---|---|---|
| | Birth Weight | | | | |
| 4 | < 2500 gram | 10 (11.8) | 5 (5.9) | | |
| | ≥ 2500 gram | 75 (88.2) | 80 (94.1) | 0.279 | - |
| | **Jumlah** | 85 (100) | 85 (100) | | |
| | Mother's Age during Pregnancy | | | | |
| 5 | < 20 years old | 2 (2.4) | 2 (2.4) | | |
| | ≥ 20 years old | 83 (97.6) | 83 (97.6) | 1.000 | - |
| | **Jumlah** | 85 (100) | 85 (100) | | |
| | Birth Order | | | | |
| 6 | ≥ 3 order birth | 21 (24.7) | 22 (25.9) | | |
| | 1-2 order birth | 64 (75.3) | 63 (74.1) | 1.000 | - |
| | **Jumlah** | 85 (100) | 85 (100) | | |

**) Very Significant Relationship (p <0.01)

The statistical test showed that birth weight is not significantly related to the incidence of stunting among children under five (p-value= 0.279 (p>0.05)), which is both stunted children (88.2%) and normal children (94.1%) tend to be born with a weight of ≥2500 grams. This result is not in line with Aryastami (2017), Nshimyiryo (2019), and Ngainis (2020) which stated that there is a significant relationship between low birth weight (<2500 grams) and the incidence of stunting. Children who were born with low birth weight had a 2 times greater risk of experiencing stunting compared to children who had a normal birth weight (≥2500 grams) (Nshimyiryo, 2019).

Children born with low birth weight experience intrauterine growth retardation since they are still in the womb, so they experience growth that takes longer than children born with normal weight. Children with low birth weight also have sub-optimal immune systems which make them more susceptible to disease (Podungge, 2021). The same thing was conveyed by Abbas (2021) who stated that children under five years old who were born with low birth weight were more at risk of experiencing infectious diseases such as diarrhea and fever. If this condition is not treated immediately, it will hinder the process of growth and development of children which can increase the risk of stunting in the future (Podungge, 2021). Meanwhile, the results of this study are in line with Anggraeni (2020) which states that there is no relationship between birth weight and the incidence of stunting. No relationship between birth weight and the incidence of stunting can occur because the majority of stunted and normal children were born with a weight that is not at risk, which is more than 2500 grams. In addition, low birth weight is known to have the greatest influence on children's growth in the first 6 months of life, if during this period children are able to improve their nutritional status, then children can grow normally and avoid stunting (Anggraeni, 2020). In addition, the occurrence of stunting in children with normal birth weight is possible due to poor parenting and extreme malnutrition after the child is born.

There is no significant relationship between the mother's age during pregnancy and the incidence of stunting among children under five (p-value= 1.000 (p > 0.05)), which is based on the percentage, of both stunted children (97.6%) and normal children (97.6%) tend to be born to pregnant women when they are over the age of 20 years. This result is not in line with Manggala (2018) and Suryanegara (2020) which state that the mother's age during pregnancy had a significant relationship with the occurrence of stunting. Suryanegara (2020) shows that pregnant women at age less than 20 years have a

20.8 times chance of having stunted children. Teenage mothers (age less than 20 years) are known to be unable to guarantee adequate nutrition for their children, access to clean water, and safe sanitation conditions (Wemakor, 2018). In addition, at the age of less than 20 years, the mother is still in infancy, so the mother will compete with the fetus she contains to get adequate nutrition, as a result, the fetus will be born with low body weight and be at risk of stunting. Then, psychologically, mothers who are less than 20 years old are not ready to breastfeed their babies after giving birth, so this will affect the growth and development of children (Santosa, 2022).

No relationship between the mother's age during pregnancy and the incidence of stunting can occur because the majority of mothers, both stunted and normal children, are pregnant at an age that is not at risk, namely more than 20 years, at which age the mother is more supportive, more positive, more able to meet the needs of their children, as well as more able to become parents (Kim, 2018). In addition, based on the results of the stunting reading diagnostic for September 2022, as many as 89.4% of mothers of stunted children have received education about health and nutrition, thus making them much better prepared for child care. The results of this study are in line with Kiik (2021) and Wardani (2022) who state that there is no significant relationship between mother's age during pregnancy and stunting among children under five.

There is no significant relationship between birth order and the incidence of stunting (p-value=1.000 (p>0.05)), in which based on the percentage, both stunted children (75.3%) and normal children (74.1%) tend to be children with the first or second birth order. The results of this study are not in line with Chungkham (2020) and Rahman (2016) which state that there is a relationship between birth order and the incidence of stunting. Chungkham (2020) states that children with third and fourth birth orders or more are at greater risk of experiencing stunting than children with second birth orders. Rahman (2016) states that children with third, fourth, and fifth birth orders are at risk of up to 1.8 times greater risk of experiencing stunting compared to children who are born for the first time. Children born later have a greater risk of experiencing growth and development disorders in line with the increasing burden borne by their parents. With an increase in the number of children, the burden on parents to meet nutritional needs and care for children is also greater, thus allowing for inequality in both fulfillment of nutrients and parenting styles (Lewa, 2020).

No relationship between birth order and the incidence of stunting can occur because the majority of stunted and normal children are first or second children, at which time the burden on parents in fulfilling nutrition and child care is not too great (Lewa, 2020). With a small family size, the availability of food in the family can be more easily fulfilled (Titaley, 2019). If this is accompanied by more adequate family economic conditions, the children's nutritional needs can be more easily fulfilled. The results of the stunting reading diagnostic in September 2022 also support this condition which shows that 62.4% of stunted children in this study come from families that have an income above the Semarang city minimum wage (*UMK*) in 2022, thus making them economically capable enough to meet children's nutritional needs.

The limitation of this study lies in the differences in treating the data. In contrast to data on birth length and birth weight of control children which were sourced from maternal delivery data, data on birth length and birth weight of case children that sourced from stunting reading diagnostic that collected retrospectively were not confirmed back into the delivery data, thus allowing for a recall bias. Several case children data sources such as birth length and birth weight have been categorized at the time the data was collected, so the data cannot be analyzed in more detail as if it were in the form of numerical data. In addition, this study did not analyze the presence of variables that could potentially become confounding.

## CONCLUSION

Based on the results of bivariate analysis that has been carried out, it is known that two variables are significantly related to the incidence of stunting among children aged 0-59 months in the area of Sekaran Primary Healthcare Center, Semarang City. The two variables are children's age (p= 0.009, OR= 2.401, CI= (1.289 – 4.471) dan birth length (p= < 0.0001, OR= 4.069, CI= (1.960 – 8.450)). Meanwhile, there was no significant relationship between gender, birth weight, mother's age during pregnancy, and birth order with the incidence of stunting. With this research, it is possible to map out which groups of children should be prioritized for screening as an effort to prevent the occurrence of stunting namely the group of children with a birth length of less than 48 cm.

For further research, if using secondary data, it is suggested that the variables of birth weight and birth length can be traced back by utilizing mother and child cohort data (delivery data). This is done to minimize the possibility of recall bias. In addition, in order to minimize the presence of confounding, analysis of confounding can be carried out. Then, for the Sekaran Primary Healthcare Center, the collection of data on birth weight and birth length in the stunting reading diagnostic process can use numerical data and not categorize beforehand, so that the data of children's birth weight and children's birth length can be analyzed numerically. In addition, in a screening effort to prevent stunting, if there is a need to prioritize certain groups, the Sekaran Primary Healthcare Center can prioritize children under five who are born with a body length of less than 48 cm.

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