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# SIDIK SIAMA: An instrument for Risk Detection of Stunting Since Pregnancy

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A B S T R A C T

Stunting problems need to be detected early so that the interventions given can reduce long-term effects. One of the reasonable periods to detect the risk of stunting is pregnancy. Ironically, there has not been an instrument to detect the risk of stunting since pregnancy. This study aims to develop and test the validity of an instrument for early detection of stunting risk since pregnancy (SIDIK SIAMA). Instrument development uses the seven stages of development from Roberth DeVellis (2017). A total of 20 women were involved in pre-testing, and 100 pregnant women were involved in instrument testing. Based on a literature search, 28 articles were used to construct the item pool and produce 10 items to be tested for validity and reliability. Content validity uses the content validity index (CVI) and construct validity used principal component analysis (PCA). Alpha Cronbach is used to test the reliability of the instrument. The validity test results showed that there were 9 valid and reliable items, with a CVI of 1 and a Measure of Sampling Adequacy (MSA) value of <0.5, and a Cronbach Alpha value of 0.682. Thus, the SIAMA SIDIK instrument has achieved good validity and reliability so that it can be used to detect the risk of stunting since pregnancy.



*Kata kunci:*

deteksi dini
faktor risiko
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A B S T R A K

Permasalahan stunting perlu dideteksi sejak dini, sehingga intervensi yang diberikan dapat mengurangi efek jangka panjang. Salah satu periode tepat untuk mendeteksi risiko stunting yaitu sejak kehamilan, ironisnya belum teridentifikasi instrumen untuk mendeteksi risiko stunting sejak masa kehamilan. Penelitian ini bertujuan untuk mengembangkan dan menguji validitas instrumen deteksi dini risiko stunting sejak kehamilan (SIDIK SIAMA). Pengembangan instrumen menggunakan tujuh tahapan pengembangan dari Roberth DeVellis (2017). Sebanyak 20 wanita terlibat dalam pre-testing dan 100 wanita hamil terlibat dalam pengujian instrumen. Berdasarkan pencarian literatur, 28 artikel digunakan untuk menyusun item pool dan menghasilkan 10 item untuk diuji validitas dan reliabilitas.Validitas isi menggunakan content validity index (CVI) dan validitas konstruk menggunakan principal component analysis (PCA). Alpha Cronbach digunakan untuk menguji reliabilitas instrumen. Hasil uji validitas menunjukan sebanyak 9 item valid dan reliabel, dengan CVI adalah 1 dan nilai Measure of Sampling Adequacy (MSA) <0.5, serta nilai Cronbach Alpha adalah 0.682. Dengan demikian, instrumen SIDIK SIAMA telah mencapai validitas dan reliabilitas yang baik, sehingga dapat dipakai untuk mendeteksi risiko stunting sejak kehamilan.

## INTRODUCTION

Stunting is still a major nutritional problem faced by various countries, including Indonesia. Data shows that the proportion of stunting due to chronic malnutrition has decreased from 2013 to 2018, 37.2% and 30.8%, respectively (Ministry of Health Republic Indonesia, 2018). In line with these data, the Indonesian Toddler Nutrition Status Survey shows a decrease in stunting from 2019 to 2021, namely 27.67% to 24.4% (Ministry of Health Republic Indonesia, 2021). However, this condition is still far below the target of the 2024 RPJMN, which is 14% (Ministry of Health Republic Indonesia, 2022).

Stunting is a growth and development disorder in children resulting from malnutrition from an early age and in the womb (The World Bank Group Joint Child Malnutrition Estimates, 2019). Stunting is measured through an index of height/length according to age (TB/U or PB/U). Stunting can occur due to inadequate health and nutritional conditions for toddlers, adolescents, women of childbearing age (WUS), and pregnant women, as well as other factors such as the socio-economic and environmental situation (Ministry of Health Republic Indonesia, 2018). Stunting can have short- and long-term impacts on children, such as impaired posture; cognitive, motor, and verbal development; increased risk of degenerative diseases; and increased morbidity and mortality (Ministry of Health Republic Indonesia, 2018).

Stunting is not only a problem in Indonesia but also in various parts of the world. Therefore, stunting is one of the targets of the Sustainable Development Goals (SDGs) (Ministry of Health Republic Indonesia, 2018). The government also has set stunting as one of the program priorities, with several programs outlined in the Minister of Health Regulation Number 39 of 2016 concerning Guidelines for Implementing the Healthy Indonesia Program with a Family Approach. Various government interventions have been carried out but have yet to help reduce the stunting rate according to the set target.

One of the stunting prevention interventions can be carried out from pre-conception to toddlers, especially during the first 1000 days of birth (HPK) or the golden period. Stunting can occur due to long-term malnutrition during the 1,000 HPK period (Isnaini, Mariza, & Putri, 2022). Malnutrition occurs from infancy in the womb and early in life after birth, but only appears after the child is 2 years old (Saadah, 2020). Thus, it is essential to carry out various preventive interventions during this golden period to minimize the incidence of stunting. One of them is by doing early detection.

Based on an understanding of literacy, several preventive intervention innovations have been carried out so that early detection can continue and cases of stunting can be identified and handled as soon as possible. Siswina & Akbarini (2020) developed an online stunting detection card with the aim that mothers, husbands, and families can apply for the 1000 HPK program and immediately go to healthcare facilities if they overcome stunted growth and development of toddlers (Siswina & Akbarini, 2021). Apart from going online, early detection innovations are carried out manually using the wall-to-health card instrument or KMS as a medium for detecting stunting in toddlers. This instrument has a sensitivity of 92% and a specification of 91% and is more practical and easy to see stunting in toddlers (Hadi, Alfridsyah, & Affan, 2019). Another innovation for detecting stunting in toddlers is the growth mat. Growth mats provide visual clues for health workers and parents of toddlers to directly see the match between the height and age of the toddler (Azizah & Achyar, 2020).

The literature review has described various innovations for the early detection of stunting and has proven to help detect stunting in toddlers. However, no instrument can detect early stunting risk early in pre-infancy life, one of which is during pregnancy. This research is essential as one of the efforts to develop stunting prevention strategies during pregnancy. So far, tackling the problem of stunting has been in the form of convergence interventions, but instruments have never been developed to detect the risk of stunting since pregnancy. By knowing the risk of stunting from an early age, risk management can be done immediately to minimize the incidence of stunting, like previous studies that developed an instrument to detect the risk of cervical cancer, thereby increasing women's participation in cervical cancer screening (Madiuw, Hermayanti, & Solehati, 2021). Thus, it is important to know the disease risk so that treatment can be done from the start. This study aims to develop an early detection instrument for the risk of stunting since pregnancy (SIDIK SIAMA).

## METHOD

### *Research design*

The research uses scale development with seven stages from DeVellis: construct identification, item pool preparation, instrument format determination, item assessment by experts, item testing, item evaluation, and scale optimization (DeVellis, 2017).

1. Determine the construct to be measured
   The initial stage in developing the instrument is determining what the developed instrument will measure, which is the goal of creating the instrument (Pett, Lackey, & Sullivan, 2003). The construct that will be measured in the SIDIK SIAMA instrument is risk factors based on the literature review discussed previously.
2. Item Pool Creation
   The SIDIK SIAMA instrument pool items were developed based on the risk factor construct obtained through a literature review. The researcher selects the relevant variables based on the literature review that will support the items.
3. Determine the format of the instrument
   The choice of item format must reflect the instrument's purpose so that it is a priority consideration when making an instrument (Pett et al., 2003). The SIAMA SIDIK instrument will use the Guttman scale, which consists of two yes and no answer options (DeVellis, 2017). The answer choices were adjusted to the purpose of making the instrument, where women answered "yes" when they believed that the risk was felt or experienced by themselves, and answered "no" if they thought that the risk was not touched or not shared by them. Each risk factor item has a score.
4. Assessment of the instrument by a panel of experts
   In this study, three experts were identified to evaluate the items. Determining the number of experts is based on guidelines from Lynn (1986); a minimum of three experts are used for item assessment (Hendryadi, 2017). All the selected experts are professionals in the field of maternal and child health, nutrition, and experts in instrument development. The expert assessment uses a

scale and is reported in the content validity index (CVI) (Bolarinwa, 2016; Fawcett & Garity, 2009). The CVI rating for each item is called Item-CVI (I-CVI) and the overall rating of the scale is referred to as Scale-CVI (S-CVI). Based on Lynn's guidelines (1986), if the number of experts is ≤5 then the I-CVI value is 1.00, meaning that all experts must agree that the item is valid content (Hendryadi, 2017). The approach that can be used in the CVI assessment is to seek universal approval from a panel of experts, where the S-CVI must reach a scale of 3 or 4 by all experts, with an ordinal scale being relevant = 1 and irrelevant = 0. Furthermore, pretesting (trial) was carried out on several pregnant women in the Ambon City area, which were used as the research location. Participants were only asked to read the items without filling in the instrument, to assess if they were difficult to understand, so that they could consider removing or modifying or adding new items.

5. Item Testing
   The number of samples for instrument testing is based on the assumption that the number of respondents must exceed the number of items, namely from 2 to 20 respondents per item, with a minimum number of 100 respondents to ensure the stability of the variance-covariance matrix (Anthoine, Moret, Regnault, Sbille, & Hardouin, 2014).
6. Evaluation of the Items in the instrument
   The next stage was evaluating the items in the instrument that have been tested based on the judgment of experts and testing the research respondents. At this stage, the construct validity of the items was tested using exploratory factor analysis (EFA), namely principal component analysis (PCA), and analyzed with varimax rotation (DeVellis, 2017). Cronbach's alpha is used to estimate the internal consistency of the instrument.
7. Optimization of Scale Length
   This stage is the final stage of instrument development, according to DeVellis, namely optimizing the length of the scale depending on the sixth stage (DeVellis, 2017). The statistical test results in the sixth stage will determine whether items will be removed or retained in the instrument.

*Sampling procedures*

The sample is pregnant women in Ambon City who make antenatal visits. This study used a consecutive sampling approach conducted in September-October 2022.

*Sample size, power, and precision*

The sample size is 100 pregnant women, assuming that the number of respondents must exceed the number of items, namely from 2 to 20 respondents per item, where the minimum number is 100 respondents to ensure the stability of the variance-covariance matrix (Anthoine, Moret, Regnault, Sbille, & Hardouin, 2014). A total of 20 women were involved in pre-testing to assess understanding related to the items.

*Measures and covariates*

Instrument development began with a literature search on electronic databases, namely Pubmed, CINAHL, Google Scholar, and Garuda, using the keywords "risk factors" AND "stunting" OR "stunted" AND "pregnancy" OR "pregnant."

The next step is to create an item pool based on a literature review into 10 items, namely mid upper arm circumference (MUAC) (Agustina & Fathurrahman, 2022; Alfarisi, Nurmalasari, & Nabilla, 2019; Sukmawati, Hendrayati, Chaerunimah, & Nurhumairah, 2018); height (Khatun, Rasheed, Alam, Huda, & Dibley, 2019; Nadiyah, Briawan, & Martianto, 2014; Özaltin, Hill, & Subramanian, 2010); weight gain during pregnancy (Apriningtyas & Kristini, 2019; Dewi, Evrianasari, & Yuviska, 2020); consumption of Fe tablets (Ashorn et al., 2015; Dewey, 2016; Georgieff, 2020); excessive nausea and vomiting during pregnancy (Buyukkayaci Duman, Ozcan, & Bostanci, 2015; Muraoka, Takagi, Ueno, Morita, & Nagano, 2020); maternal age (Wanimbo & Wartiningsih, 2020; Wemakor, Garti, Azongo, Garti, & Atosona, 2018); mother's smoking habits and history of exposure to cigarette smoke (Ashford et al., 2010; Nadiyah et al., 2014; Stock & Bauld, 2020); birth spacing (Anasari & Suryandari, 2022; Karundeng, Ismanto, & Kundre, 2015; Pongrekun, Sunarsih, & Fatmawati, 2020); mother's education (Komalasari, Supriati, Sanjaya, & Ifayanti, 2020; Scheffler et al., 2021).

The instrument format consists of risk factor statements and answers choices. The answer choices on the instrument consist of two options, with a score of 1 = at risk and 0 = not at risk.

The expert assessment form uses the content validity index (CVI). CVI was assessed by three experts: academics in nutrition, maternal and child health, and psychometric experts. Based on Lynn's guidelines (1986), if the number of experts is ≤5, then the I-CVI value is 1.00, meaning that all experts must agree that the item is good content (Hendryadi, 2017). The approach that can be used in the CVI assessment is to seek universal approval from a panel of experts, where the S-CVI must reach a scale of 3 or 4 by all experts, with an ordinal scale being relevant = 1 and irrelevant = 0.

*Data analysis*

The content evaluation uses the content validity index (CVI), while construct evaluation uses the principal component analysis (PCA) method. The most recommended approach is the Kaiser and Cattell method based on the eigenvalue of 1.0 (DeVellis, 2017). Correlation matrix analysis was used to analyze the pattern of co-variation and correlation between items through Barlett's test of sphericity with a significant value of $p<0.05$ and Kaiser-Meyer-Olkin (KMO) with a value of 0.6. In addition, an anti-image correlation item value of >0.5 is required to perform further factor analysis. In the advanced factor analysis, the loading factor value of 0.40 was used as significance in defining the factor. Reliability test using alpha Cronbach.

## RESULTS

*Content Validity*

The results of the final calculation of content validity based on expert judgment show that the I-CVI value for expert 1 is 1 (100%), expert 2 is 1 (100%), and expert 3 is 1 (100%), with a mean value of I-CVI or S- CVI is 1 (100%). This final score is referred to as the average congruency percentage (ACP), which according to Waltz (2010), an instrument with an ACP value of greater than 90% is accepted. So that all items in the tool have fulfilled content validity. Table 1 shows the results of CVI calculations on 10 items.

**Table 1. Results of content validity assessment**

| No | Butir Item | CVI |
|---|---|---|
| 1 | I'm not between 20 and 35 years old | 3/3=1 |
| 2 | My current upper arm circumference is less than 23.5 cm | 3/3=1 |
| 3 | My height is under 150 cm | 3/3=1 |
| 4 | My weight gain during pregnancy was less than 1 kg every month | 3/3=1 |
| 5 | I rarely or have not taken Fe tablets or iron tablets during pregnancy | 3/3=1 |
| 6 | I experienced excessive nausea and vomiting during this pregnancy, so there was very little food to eat | 3/3=1 |
| 7 | I have a habit of smoking before or during pregnancy | 3/3=1 |
| 8 | I have a history of exposure to secondhand smoke at home or work | 3/3=1 |
| 9 | The distance between the current birth and the previous child is less than 2 years | 3/3=1 |
| 10 | Total family income (husband and wife) below the provincial minimum wage | 3/3=1 |
| | S-CVI | 1 |

*Item Testing*

Most respondents were between 20-35 years, namely 50%, and most had a high school education level of 51%. Most respondents were primigravidas (first pregnancies), namely 59%, as many as 69% were in the second trimester, and the highest number of antenatal care (ANC) visits was 2 times, namely 43%. Table 2 shows the characteristics of the respondents in testing the instrument items.

*Construct Validity*

Assessment of construct validity using confirmatory factor analysis (CFA) method, using principal component analysis (PCA). The results of the anti-image correlation analysis show that there is one item, item number 5, which has a Measure of Sampling Adequacy (MSA) value of <0.5, which is 0.483, so that item needs to be eliminated. The results of the final analysis with 9 items show the Kaiser Meyer Olkin Measure of Sampling Adequacy (KMO MSA) value of 0.625 (≥0.6), and the MSA value of each item is >0.5. Meaning that it meets the requirements for factor analysis and has a strong significance, namely Barlett's value of sphericity p=0.000 (p<0.05). The study results of the instrument's main components are described in table 3.

**Table 2. Frequency distribution based on the characteristics of the respondents (n = 100)**

| Characteristics of Respondent | Total | |
|---|---|---|
| | n | % |
| Age (Year) | | |
| <20 | 14 | 14,0 |
| 20-35 | 50 | 50,0 |
| >35 | 36 | 36,0 |
| Education | | |
| Elementary School | 0 | 0 |
| Junior High School | 10 | 10,0 |
| Senior High School | 51 | 51,0 |
| Academic/University | 39 | 39,0 |
| No School | 0 | 0 |
| Number of pregnancies | | |
| 1 | 59 | 59,0 |
| 2 | 4 | 4,0 |
| 3 | 17 | 17,0 |
| >3 | 20 | 20,0 |
| Gestational age | | |
| Trimester I | 8 | 8,0 |
| Trimester II | 69 | 69,0 |
| Trimester III | 23 | 23,0 |
| Number of ANC Visits | | |
| 1 | 37 | 37,0 |
| 2 | 43 | 43,0 |
| ≥3 | 20 | 20,0 |

**Table 3. Results of instrument factor analysis (n = 9 items)**

| Items | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|
| Factor 1 | | | |
| 2. My current upper arm circumference is less than 23.5 cm | 0,865 | | |
| 6. I experienced excessive nausea and vomiting during this pregnancy, resulting in little food to eat | 0,859 | | |
| Factor 2 | | | |
| 3. My height is under 150 cm | | 0,777 | |
| 4. My weight gain during pregnancy is less than 1 kg every month | | 0,632 | |
| 7. I had a habit of smoking before or during pregnancy | | 0,754 | |
| 10. Total family income (husband and wife) is below the provincial minimum wage | | 0,642 | |
| Factor 3 | | | |
| 1. I am not between the ages of 20 and 35 | | | 0,832 |
| 8. I have a history of exposure to secondhand smoke at home or work | | | 0,608 |
| 9. The distance between the current birth and the previous child is less than 2 years | | | 0,538 |

*Reliability Test*

The instrument reliability test was carried out on 9 items using the Cronbach Alpha value, which is illustrated in table 4. The calculation results show that the Cronbach Alpha value is 0.682 (ri>0.60), so the SIAMA SIDIK instrument is said to be reliable.

**Table 4. Results of Cronbach Alpha analysis (n=100)**

| Total of item | Number of respondents | Alpha |
|---|---|---|
| 9 | 100 | 0,682 |

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*Optimization of Scale Length*

The final results of the validity and reliability tests resulted in 9 SIAMA SIDIK instrument items which changed from 10 items, described in table 5.

**Table 5. The final result of instrument revision (n=9 items)**

| No | Items |
|---|---|
| 1 | My current upper arm circumference is less than 23.5 cm |
| 2 | I experienced excessive nausea and vomiting during this pregnancy, so there was very little food to eat |
| 3 | My height is under 150 cm |
| 4 | My weight gain during pregnancy was less than 1 kg every month |
| 5 | I have a habit of smoking before or during pregnancy |
| 6 | Total family income (husband and wife) below the provincial minimum wage |
| 7 | I'm not between 20 and 35 years old |
| 8 | I have a history of exposure to secondhand smoke at home or work |
| 9 | The distance between the current birth and the previous child is less than 2 years |

**DISCUSSION**

The development of an instrument for early detection of stunting risk since pregnancy (SIDIK SIAMA) has been carried out based on seven stages of scale development, namely construct identification, item pool preparation, instrument format determination, item assessment by experts, item testing, item evaluation, and scale optimization (DeVellis, 2017).

Factor analysis was carried out on 9 items in the SIDIK SIAMA instrument through varimax rotation analysis, resulting in the following three factors. Factor one consists of the item "my current upper arm circumference (LILA) is less than 23.5 cm" with a loading value of 0.865, and the item "I experience excessive nausea and vomiting during this pregnancy, so there is only a small amount of food that can be eaten" with a loading value of 0.859. Factor one is named the factor of nutritional status. Factor two consisted of the item "my height is under 150 cm" with a loading value of 0.777, "my weight gain during pregnancy was less than 1 kg per month" with a loading value of 0.632, "I had a habit of smoking before or during pregnancy" with a loading value of loading 0.754, and "the total family income (husband and wife) is below the provincial minimum wage (UMP Maluku Rp. 2,619,312)" with a loading value of 0.642. The second factor was named the factor of health history and lifestyle. Factor three consists of the items "I am not between 20 and 35 years old" with a loading value of 0.832, "I have a history of exposure to cigarette smoke at home or work" with a loading value of 0.608, and "the current birth distance with the previous child is less than 2 years" with a loading value of 0.538. Factor three is named factor of maternal characteristics.

The nutritional status of pregnant women is usually categorized as chronic energy deficiency (CED) with mid upper arm circumference less than 23.5 and normal with mid upper arm circumference more or equal to 23.5. These results are in line with the research by Alfarisi et al. (2019) and Sukmawati et al. (2018) that a history of maternal nutritional status with CED is associated with the incidence of stunting in toddlers (Agustina & Fathurrahman, 2022; Alfarisi et al., 2019; Sukmawati et al., 2018). Pregnant women with CED in the last trimester cause a lack of adequate nutrition to meet the physiological needs of pregnancy, namely hormonal changes and increased blood volume for fetal growth. This impacts the lack of nutrient supply to the fetus, so fetal growth and development are hampered, resulting in low birth weight (LBW), which is associated with stunting (Alfarisi et al., 2019).

Maternal malnutrition in the first trimester of pregnancy can be caused by hyperemesis gravidarum because it results in malnutrition, electrolyte imbalance, and poor fetal development, such as prematurity and low birth weight (Santosa, Arif, & Ghoni, 2022). This condition is closely related to stunting because it can affect the growth and development of the fetal brain, which results in an increased risk of neurodevelopmental delays in the future (Buyukkayaci Duman et al., 2015; Muraoka et al., 2020). A research result revealed that children with hyperemesis gravidarum mothers have behavioral disorders (Fejzo et al., 2009). Women with extreme weight loss due to hyperemesis gravidarum are more likely to have a longer recovery time, postpartum gastrointestinal problems, muscle pain, gallbladder dysfunction, and post-traumatic stress disorder. These conditions also impact children's growth and development (Fejzo, Magtira, Schoenberg, Macgibbon, & Mullin, 2015).

A mother's height of less than 150 cm is a risk factor for stunting in children aged 0-23 months (Khatun et al., 2019; Nadiyah et al., 2014; Özaltin et al., 2010). A mother's height is a measure of cumulative nutrition over a long time, which can affect fetal growth so that a height of less than 150 cm is at risk of giving birth to stunted babies (Perkins, Subramanian, Smith, & Özaltin, 2016). Stunting caused by genetic factors impacts growth that is not optimal, so women as adults tend to experience complications during pregnancy, difficulty during childbirth, and can cause death. In addition, mothers who are stunted have the potential to have stunted children due to cycles of malnutrition between generations (Rufaida, Raharjo, & Handoko, 2020).

Apart from height, weight gain during pregnancy is also related to the incidence of stunting (Apriningtyas & Kristini, 2019). Dewi et al.'s research results show that mothers who do not gain weight during pregnancy have a 7 times higher risk of having a stunted child (Dewi et al., 2020). Weight gain during pregnancy is an essential factor in the physical development of the fetus because it is related to the amount of food intake the fetus receives (Apriningtyas & Kristini, 2019). Weight gain during pregnancy describes the nutritional adequacy of pregnant women and indirectly describes intra-uterine fetal growth (Lada, Batubara, Bardosono, Irawati, & Salimar, 2019). Irawati and Rachmalina's study of 94 pregnant women in Bogor concluded that maternal body mass index before pregnancy was the most influential risk factor for maternal weight gain during pregnancy (Irawati & Rachmalina, 2013).

The results showed that there was a positive and robust relationship between the mother's smoking behavior and severe stunting (OR=1.49; 95%CI:1.29–1.71), as well as a significant relationship between the father's habit of smoking at home and stunting ($p<0.05$) (Nadiyah et al., 2014). Women who smoke three months before becoming pregnant and continue until the first trimester increase the risk of premature babies, as well as women who are exposed to cigarette smoke or secondhand smoke (Ashford et al., 2010). Smoking is an immunosuppressant both in vivo and in vitro. Immune function abnormalities in cord blood were identified in children of mothers who smoked during pregnancy. Smoking during pregnancy is associated with lower birth weight and length (Kyu, Georgiades, & Boyle, 2009; Nadiyah et al., 2014).

Maternal age also has a significant relationship with the incidence of stunting. Pregnant women who are still classified as teenagers (<20 years) have a higher risk of having stunted offspring than mothers of reproductive age (20-34 years) (Wanimbo & Wartiningsih, 2020). Another similar study was conducted in Ghana, where the mother's age had a significant relationship with the incidence of stunting, and under-fives of teenage mothers had 8 times the risk of experiencing stunting compared to mothers who were old enough or reproductive age (Wemakor et al., 2018). The reproductive organs of women under 20 years old are not ready for pregnancy and childbirth (Nadiyah et al., 2014).

Another factor that influences the incidence of stunting is birth spacing. This is proven through research results that mothers with birth spacing ≤2 years have a higher risk of having stunted children (Anasari & Suryandari, 2022; Karundeng et al., 2015; Pongrekun et al., 2020). Pregnancy spacing of fewer than 2 years can cause poor fetal growth and affect the delivery process, namely prolonged labor and bleeding during delivery, due to the condition of the uterus that has not recovered correctly (Jayanti & Ernawati, 2021).

This research has three advantages. First, the SIDIK SIAMA instrument is the first instrument in Indonesia to detect the risk of stunting since pregnancy, which has been tested for validity and reliability. Second, the SIDIK SIAMA instrument has items that are relatively short and easy to understand so that it can be used independently by pregnant women. Third, apart from being used independently by pregnant women, this instrument can also be used as a research instrument.

## LIMITATIONS OF THE STUDY

This study has several limitations, namely the preparation of item pools using only the results of a literature search, not based on primary research. In addition, researchers have not examined cultural aspects as a risk factor for stunting. For this reason, further research is still needed to add items related to culture influencing the incidence of stunting.

## CONCLUSIONS AND SUGGESTIONS

This research has produced a valid and reliable SIDIK SIAMA instrument for early detection of the risk of stunting since pregnancy. In addition to pregnant women being able to detect the risk of stunting independently, health workers can also be assisted in antenatal care. By recognizing the risk of stunting since pregnancy, immediate intervention can be implemented to minimize the risk of incidents. In addition, the SIDIK SIAMA instrument can be used in future research to determine the risk of stunting in pregnant women.

## ETHICAL CONSIDERATIONS

This research has received ethical approval from the Health Research Ethics Committee of Airlangga University Number 186/EA/KEPK/2022. Researchers have also obtained research permits from the Ambon City health office.

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## Conflict of Interest Statement

The authors declare no conflict of interest.

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