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Stunting prevention behavior among children under two years based on integrated behavior: A model development

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ABSTRACT

Introduction: Stunting, a form of chronic malnutrition, continues to increase annually in Indonesia, making it the third country with the highest prevalence of stunting in Southeast Asia. This study aimed to analyze what factors were most dominant that influenced family behavior toward stunting prevention in the Bangkalan Region.

Methods: This research follows an analytical observational approach with a cross-sectional design. The study involved a sample size of 110 participants. Inclusion criteria for this study encompassed children aged 0-24 months residing with their mothers, mothers in good physical and mental health, and both children and mothers living in the Bangkalan district. The sampling technique involved multistage random sampling, followed by stratified sampling using a proportionate stratified random sampling method. Data collection was conducted using a questionnaire. Seven questionnaires are used: attitude, personal agency, knowledge, intention, behavior and environmental barrier. The distribution of questionnaires involved direct engagement with several field officers. The analysis technique employed in this study is partial least squares (PLS) using structural equation modeling (SEM).

Results: We found three factors significantly influencing mothers' behavior in stunting prevention among habits (*P*-value 0.031; T 2.221), intentions and knowledge of mothers in stunting prevention (*P*-value <0.001; T 5.744). The extent of the mother's intention to prevent stunting was influenced directly by the mother's agency (*P*-value 0.044; T 2.399) and attitude regarding stunting (*P*-value <0.001; T 7.920).

Conlusions: Intention is a direct influence driving factor for individuals to shape behavior, which is influenced by personal attitudes and beliefs. Effective stunting prevention strategy in children under two years is through the development of a stunting prevention behavior model for caregivers through improvements in attitudes, beliefs, norms, personal agencies, knowledge and skills to perform the behavior, intentions, and habits as a family empowerment effort to prevent stunting

Keywords: intentions; parenting; prevention; stunting

INTRODUCTION

Stunting, characterized by chronic malnutrition, is a prevalent issue in Indonesia, with its prevalence increasing annually. The condition is identified by short stature in toddlers, measured using the Length-for-Age or Height-for-age index. Standard anthropometric assessments classify children as stunted if their measurement results fall below the threshold (Z-score) of <-2 SD to -3 SD (short/stunted) and <-3 SD (very short/severely stunted) (Kemenkes RI, 2018). According to the *Survey Status Gizi Indonesia*/Indonesian Nutritional Status Survey (SSGI), over the past three years, stunting has been the most prevalent nutritional problem, surpassing malnutrition, wasting, and obesity. In 2021, Bangkalan Regency in East Java had the highest prevalence of stunting among all districts, reaching 38.9%, while the national incidence of stunting in Indonesia stands at 24%. Several risk factors contribute to stunting, including low birth weight (BBLR), birth length, history of exclusive breastfeeding, family income, nutritional education, number of family members, prenatal environment, maternal height below 150 cm, pre-lactative feeding, and poor sanitation during the ages of 24-48 months (Ni'mah et al., 2016). Additionally, birth length, maternal height, and exposure to pesticides are identified as risk factors for stunting in children aged 2-5 years (Syam et al., 2020). The consequences of stunting are significant, including short stature in adulthood, poor cognitive performance, and low academic achievement (Noviana et al., 2023), as well as diminished cognitive and academic performance (Walker et al., 2007).

The study found that the mother-in-law treats 70% of stunting in Balita while 30% is in the nursing of grandmothers or large families because the mother works. Madura's big family still implements a paternity pattern of a Madura culture that does not support stunting prevention. The aforementioned research findings, supported by a study conducted by Illahi and Muniroh (2018) in the Bangkalan district, revealed several concerning practices related to breastfeeding and infant care. These practices include 22.6% of mothers discarding colostrum due to perceived impurity, 14.5% of babies not receiving early breastfeeding initiation, 59.7% of mothers providing prelactal feeding to newborns, a cultural practice of feeding rice *lothek* with bananas to infants

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Table 1. Behavioral Model Variables for Stunting Prevention Among Mothers

Variables	Indicators
X1 Attitude	X1.1 Experimental attitude X1.2 Instrumental Attitude
X2 Personal Agency	X2.1 Perceived control X2.2 Self-efficacy
X3 Knowledge and skill	X3.1 Knowledge X3.2 Skill
X4 Environmental barriers	X4.1 Environmental barriers that make implementation difficult X4.2 Environmental barriers that make action impossible
X5 Habits	X5.1 Childcare experience X5.2 Habit patterns
Y1 Intention of behavior	Y1.1 Behavioral motivation Y1.2 The intention that moves the action
Y2 Behavior	Y2.1 Monitoring Y2.2 Mentoring Y2.3 Modelling

X, Exogent Variable; Y, Endogent Variable

under six months of age to promote growth, and 35.5% of mothers introducing complementary milk before the age of six months (Illahi & Muniroh, 2018). Given these findings, there is a need to develop a model of maternal behavior in nursing children aged 0-24 months, utilizing the Integrated Behavior Model (IBM) approach. IBM is a behavioral change theory that identifies attitude, perceived norm, and personal agency as key determinants of behavior. In addition to these factors, IBM incorporates variables such as knowledge and ability to perform behavior, intention, habits, environmental constraints, and salience of behaviors, which directly or indirectly influence individuals' behaviors (Glanz et al., 2008).

Stimulation will affect physical growth and intelligence, affecting the quality of work, which is not good enough to make productivity low. Stunting can also reduce brain performance, reducing children's performance at school, weakening the immune system, and producing disorders (Kemenkes RI, 2018). Children affected by stunting commonly display reduced verbal and total intelligence quotient (IQ) scores in contrast to those unaffected by stunting. Nonetheless, children who undergo catch-up growth after experiencing stunting at the age of two often exhibit higher cognition scores compared to those who remain consistently stunted throughout childhood (Koshy et al., 2022).

The government's efforts to prevent stunting are carried out through programs to improve children's nutritional status. Second, environment-based sanitation improves the quality of environmental sanitation with priority targets in villages with a high prevalence of stunting, and third, it develops drinking water infrastructure to improve the quality of human life. Fourth, administering drugs or food to pregnant women or babies 0-23 months, for children in the first 1,000 days of life (HPK) (Kemenkes RI, 2018). This study utilizes the Integrated Behavior Model (IBM) to identify the primary factors influencing family behavior regarding stunting prevention in children under two years of age. The IBM theory is deemed suitable for this research as it integrates individual internal influences with the impact of environmental barriers. The anticipated outcomes of this study include enhancing intervention strategies in infectious disease prevention programs, particularly in the development of targeted health promotion initiatives aimed at preventing stunting in children under two years old (Raksanagara et al., 2017). The primary objective of this study is to analyze the key factors driving family behavior toward stunting prevention in the Bangkalan Region.

METHODS

Design

An observational analytical research design employing a cross-sectional approach was utilized to observe multiple variables simultaneously.

Sample and Setting

The population for this study consisted of mothers with children aged 0-24 months residing in the District of Bangkalan, East Java, Indonesia. The sample size was determined using the rule of thumb, which suggests 5-10 times the number of independent variables. Thus, the study aimed for a sample size of 100, with an additional 10% to account for potential dropouts, resulting in a final sample of 110 respondents. Purposive sampling was employed for participant selection. Inclusion criteria comprised: (a) Mother and child cohabitating, (b) Mother proficient in reading, writing, and understanding Bahasa (National Indonesian Language), (c) Mother in good physical health, and (d) Mother and child residing in the Bangkalan district.

Variables

The independent variables included in the study were (X1) Attitude, (X2) Personal Agency, (X3) Knowledge and Skill, (X4) Environmental Barriers, and (X5) Habits. The dependent variables were (Y1) Intention and (Y2) Behavior to prevent stunting (Table 1).

Instruments

Data collection using the questionnaire was distributed directly with the involvement of three enumerators. Six questionnaires used attitudes, personal agencies, knowledge and skill, environmental barriers, habits, intentions, and behavior. The questionnaires were based on the Integrated

Behavior Model (IBM) theory and the concept of stunting prevention.

Attitude

The questionnaire was designed to assess attitudes toward behavior, constructed based on the Integrated Behavior Model (IBM) theory and tailored to indicators related to the prevention of stunting. It comprised 10 questions divided into two parts: experimental attitudes and instrumental attitudes. The questionnaire utilized a nominal scale with a Likert scale ranging from 1 to 4. Scoring criteria were as follows: for favorable questions (+), 4 indicated strongly agree, 3 indicated agree, 2 indicated disagree, and 1 indicated strongly disagree; for unfavorable questions (-), 1 indicated strongly agree, 2 indicated agree, 3 indicated disagree, and 4 indicated strongly disagree.

Personal Agency

The questionnaire was developed based on the Integrated Behavior Model theory, which was adapted to include indicators relevant to stunting prevention. It comprised 10 statements divided into two sections: Perceived Control (statements 1–5) and Self-Efficacy (statements 6–10). Each section contained five statements. Scoring was determined as follows: a score ≥ mean indicated good, while a score < mean indicated less. For favorable questions (+), respondents rated 4 for strongly agree, 3 for agree, 2 for disagree, and 1 for strongly disagree. For unfavorable questions (-), respondents rated 1 for strongly agree, 2 for agree, 3 for disagree, and 4 for strongly disagree.

Knowledge and Skill

The assessment of knowledge and skill in stunting prevention was conducted using a questionnaire based on the Integrated Behavior Model (Glanz et al., 2015), adapted by the researchers. The questionnaire encompassed components related to understanding the causes, effects, and prevention of stunting. It comprised 10 true or false questions. Scoring was based on an ordinal scale: Good (76%-100%), Moderate (56%-75%), and Less (<56%).

Environmental Barriers

The questionnaire was constructed based on the Integrated Behavior Model theory, tailored to include indicators relevant to stunting prevention. It comprised 12 questions divided into two sections: Environmental barriers to implementation (statements 1–6) and Environmental barriers to action (statements 7–12). Each section contained 6 statements. Scoring criteria were established as follows: a score ≥ mean indicated good, while a score < mean indicated less. For favorable questions (+), respondents rated 4 for strongly agree, 3 for agree, 2 for disagree, and 1 for strongly disagree. For unfavorable questions (-), respondents rated 1 for strongly agree, 2 for agree, 3 for disagree, and 4 for strongly disagree.

Habits

The instrument utilized the Integrated Behavior Model theory, adapted by the researchers to suit the research focus, comprising eight statements. Indicator questions encompassed DM childcare experience and habit patterns. Respondents rated each statement on an ordinal scale using a Likert scale of 1–5. For favorable questions (+), respondents rated 5 for always, 4 for often, 3 for sometimes, 2 for rarely, and 1 for never. For unfavorable questions (-), respondents rated 1 for always, 2 for often, 3 for sometimes, 4 for rarely, and 5 for never.

Intention

The instrument was structured based on the Integrated Behavior Model (IBM) theory, comprising 10 statements. Each statement was rated using an ordinal scale with a Likert scale of 1–4. Scoring for favorable questions (+) was as follows: 4 for strongly agree, 3 for agree, 2 for disagree, and 1 for strongly disagree. Scoring for unfavorable questions (-) was as follows: 1 for strongly agree, 2 for agree, 3 for disagree, and 4 for strongly disagree.

Behavior

The instrument was structured based on the Integrated Behavior Model (IBM) theory, comprising 10 statements. Each statement was rated using an ordinal scale with a Likert scale of 1–5. For favorable questions (+), a score of 5 indicated "always," 4 indicated "often," 3 indicated "sometimes," 2 indicated "rarely," and 1 indicated "never." For unfavorable questions (-), the scoring was reversed, with 1 indicating "always," 2 indicating "often," 3 indicating "sometimes," 4 indicating "rarely," and 5 indicating "never."

Procedure

The study took place between March and June 2023 in Bangkalan, East Java, Indonesia. Researchers introduced themselves and provided a comprehensive explanation of the study's benefits, objectives, and approval procedures using the informed consent form. Subsequently, questionnaires were distributed to the respondents, covering various aspects, including attitude, personal agency, knowledge and skill, environmental barriers, habits, intention, and behavior.

Data Analysis

Statistical analyses were performed using SEM-PLS, with descriptive statistics such as numbers, percentages, and mean and standard deviations utilized to depict respondent characteristics. The structural equation modeling (SEM) model employed variance or component-based Partial Least Squares (PLS). Evaluation of the model comprised two main parts: outer model evaluation for validity and reliability indicators and inner model evaluation for causal relationships between variables.

Convergent validity was assessed by examining the correlation between reflective indicator scores and latent variable scores, with a factor loading value of 0.5 to 0.6 indicating indicator validity. Discriminant validity was determined by comparing cross-loading correlations with the latent variable, ensuring they exceeded correlations with other variables. An average variance extracted (AVE) value above 0.5 and composite reliability ≥ 0.7 were considered satisfactory.

The inner model evaluation assessed the magnitude of influence or causal relationships between variables, with the coefficient of determination (R square) indicating the extent of independent variables' influence on the dependent variable. A Q2 value above two and approaching 1 indicated predictive relevance, while a Q2 value below zero indicated no predictive relevance.

Ethical Considerations

The study received ethical approval from the District Bangkalan, East Java, Indonesia, with approval number 1792/KEPK/STIKES-NHM/EC/IV/2023 on April 15th, 2023. Written consent was obtained from all participants after the study's purpose was explained, and informed consent forms were collected.

RESULTS

The majority of respondents, aged 21–36 years old, had an elementary school level of education, and their attitudes were negative. Half of the respondents exhibited low personal agency. Knowledge and skill regarding stunting prevention were also low. The distribution of intentions showed that most respondents were insufficiently aware of stunting prevention. Additionally, respondents' behavior in preventing stunting was inadequate, although environmental barriers were reported to be favorable (Table 2).

Table 3 states that the results of the composite reliability test for exogenous latent variables yield a value of more than 0.7. This means that the indicators used in construct measurement are fully reliable and robust (able) to measure the construct. All latent constructs are reliable because Cronbach's alpha score is more than 0.6 in the marginally reliable category but meets the composite reliability test. Based on the AVE value, if measuring convergent validity is > 0.5, then convergent validity is good.

The structural model analysis was conducted to assess the impact of exogenous factors on endogenous factors, using a reference value of the T-table = 1.96. Exogenous factors influence endogenous factors if the T-statistic value exceeds 1.96 with an error tolerance (α) of 5%. The comprehensive

Table 2. Distribution of Demographic Data, Independent, and Dependent Variables (n=110)

Variable	n	%
Age		
17-20 years	23	20.9
21-36 years	56	50.9
37-42 years	31	28.2
Education		
No school	4	0.8
Elementary School	54	26.0
Junior High School	21	18.0
Senior High School	31	41.0
Attitude		
Positive	43	39.1
Negative	67	60.9
Personal Agency		
Good	21	19.1
Enough	34	30.9
Less	55	50.0
Knowledge and skill		
Good	24	21.8
Enough	36	32.7
Less	50	45.5
Environmental barriers		
Good	85	77.3
Less	25	22.7
Habits		
Good	24	21.8
Enough	40	36.4
Less	46	41.8
Intention of behavior		
Good	41	37.3
Less	69	62.7
Behavior		
Good	32	29.1
Enough	32	29.1
Less	46	41.8

Table 3. Construct validity and reliability

Indicator Variable	Cronbach's Alpha	Composite Reliability (rho-a)	Composite Reliability (rho-c)	The Average Variance Extracted (AVE)
Environmental barrier	0.804	0.961	0.885	0.732
Habits	0.987	0.990	0.991	0.974
Intention	0.973	0.973	0.983	0.949
Knowledge	0.982	0.983	0.998	0.965
Behavior	0.997	0.997	0.988	0.993
Personal agency	0.919	0.927	0.961	0.925
Attitude	0.992	0.992	0.996	0.992

Table 4. Inner Model

Causality Relationship	Coefficient	T-Statistic	Influence
The relationship between environmental barriers and behavior	0.104	1.626	Insignificant
The relationship between habits and behavior	0.031	2.221	Significant
The relationship between knowledge and behavior	0.033	2.129	Significant
The relationship between intention and behavior	0.000	5.744	Significant
The relationship between personal agency and attitude	0.044	2.399	Significant
The relationship between attitude and intention	0.000	7.920	Significant

significance test results are detailed in Table 4.

Based on Table 4, it was found that all relationships had a statistic of more than 1.96, so it significantly affected, except for the relationship between environmental barriers and maternal parenting behavior in preventing stunting.

The coefficient of determination for intention (Y1) is 0.955, indicating that 95.5% of the variation in intention toward preventing stunting in children under two years is explained by attitude and personal agency, while the remaining 4.5% is attributed to other variables not accounted for in the research model. Similarly, the coefficient of determination for maternal behavior in stunting prevention is 0.981, signifying that 98.1% of the variability in maternal behavior is explained by intention, knowledge, environmental barriers, and habits, with the remaining 1.9% influenced by unaccounted variables (Table 5).

Table 5. R-square value

Indicator variables	Coefficient of Determination
Intention	0.955
Behavior	0.981

DISCUSSION

The PLS-SEM analysis results revealed that four variables significantly impacted mothers' behavior in preventing stunting in children under two years. These included both indirect factors, such as attitude and personal agency, as well as direct factors, namely intention and, knowledge and habits. Based on the statistical T value, the one with the highest significance directly influencing behavior is the intention, and the one with the greatest influence on the intention is the mother's attitude. This shows that intention significantly influences the formation of maternal behavior in stunting prevention. The Integrated Behavior Model (IBM) underscores that behavioral intention plays a pivotal role in driving behavior change (Glanz et al., 2015). It emphasizes the significance of intention as a motivating factor for behavior. Without motivation, individuals may struggle to adopt recommended behaviors. In the context of stunting prevention, a mother's behavior is influenced by her intention to prevent stunting in her child. The magnitude of your intentions has a direct impact on your actions. A strong intention will reduce the obstacles and difficulties encountered and increase the mother's understanding of the benefits of her chosen action. It means that obstacles and difficulties will not hinder the mother's action; instead, strong intentions will motivate the mother to engage in behavior that she believes is beneficial to her child's health in stunting prevention.

The study by Wicaksana et al. (2023) conducted an analysis to pinpoint the specific beliefs underlying the Integrated Behavior Model (IBM) construct that best elucidated the intention to vaccinate against COVID-19. Additionally, the correlation between the intention level and the status of the first COVID-19 vaccination was examined using the Kendall Tau-B method (Wicaksana et al., 2023). This aligns with findings from Peng et al. (2021), indicating that behavioral intentions tend to correlate with actual behavior positively. Various studies have demonstrated that behavioral intention can effectively predict actual behavior, such as utilizing public transportation and engaging in microblogging. For instance, research on Chinese WeChat users revealed that attitudes, subjective norms, and personal norms regarding sharing environmental information significantly influenced their behavioral intentions (Peng et al., 2021).

The data analysis results indicate that the mother's knowledge about stunting significantly influences the formation of her behavior in child rearing, as evidenced by a T statistic of 2.129. This implies that a mother's level of knowledge about stunting plays a crucial role in shaping her behavior to prevent stunting in children under two years old. This finding aligns with the Integrated Behavior Model (IBM), which posits that knowledge and skills are essential components that directly impact behavior. Specifically, having a strong understanding of the causes, influencing factors, impacts, and prevention methods of stunting can positively influence a mother's caregiving practices to prevent stunting in young children. Additionally, Glanz et al. (2015) incorporated perceived behavioral control into the Theory of

Planned Behavior (TPB) model, highlighting the significance of individuals' perceived control over their behavior, which, in conjunction with intention, directly influences behavior, particularly when voluntary control is limited .

Several factors, such as research results, knowledge, habits, personal agency, attitudes, and intentions, influence mothers' behavior in stunting prevention. At the same time, environmental barriers do not affect them. A mother who has a good knowledge of the benefits and importance of stunting prevention and the negative impact of stopping will increase her intention to take precautionary measures. A positive mother with a positive attitude will have a positive perception that it is necessary to take certain measures to ensure that her child is healthy. four factors that influence intentions to take stunting prevention measures. The mother with high intentions in doing action is the key to the success of the mother's actions in stunting prevention. A high-intentioned mother will be able to overcome obstacles and have a positive view of the benefits of the action she chooses. This will motivate her always to try to prevent stunting in her child aged 0-24 months.

The data analysis revealed that attitude indirectly influences the formation of parenting behavior for stunting prevention in children under two years old by directly impacting the mother's intention. The statistical analysis yielded a significant T value of 7.920 for the attitude factor, indicating it has substantial significance in shaping maternal behavioral intentions. In line with the Integrated Behavior Model, experiential attitude refers to an individual's emotional response to behavioral recommendations. Those with a strong positive emotional reaction are more inclined to engage in the recommended behavior, while those with a strong negative emotional response are less likely to do so. On the other hand, instrumental attitudes are based on beliefs about the outcomes of behavioral performance, as observed in the Theory of Reasoned Action (TRA) or Theory of Planned Behavior (TPB) (Glanz et al., 2015).

Similar to prior research findings by Peng et al. (2021), attitudes, subjective norms, and perceived behavioral control were found to influence behavioral intentions significantly. A positive attitude tends to have a stronger influence on drivers' behavior compared to a negative attitude. The personal agency variable, evidenced by a statistical T value of 2.399, significantly impacts a mother's attitude in shaping the intention to engage in stunting prevention behaviors. Personal agency reflects an individual's capacity to initiate and provide rationales for behavior. Self-efficacy pertains to one's belief in one's abilities, while competence refers to their skill level. Perceived control entails an individual's sense of control over their behavior (Peng et al., 2021). Research conducted by Zhang and Wang (2022) highlighted the importance of attitudes toward behavior (ATT), subjective norms (SN), and perceived behavioral control (PBC) as primary determinants for predicting an individual's behavior or intentions. ATT refers to an individual's positive or negative assessment of specific behaviors (Zhang & Wang, 2022).

The Theory of Planned Behavior has been widely used to interpret various behaviors, shedding light on the interrelationships among its three constructs: Attitude (ATT), Subjective Norms (SN), and Perceived Behavioral Control (PBC). Notably, the Norm Activation Model (NAM) delves deeper into how an individual's internal moral compass influences behavioral choices. This model comprises three key components: Personal Norms (PN), Awareness of Consequences (AC), and Ascription of Responsibility (AR). AC assesses whether individuals recognize the positive or negative consequences of their behavior on others, while AR gauges whether they attribute the consequences to themselves.

Given that awareness of consequences reflects individual beliefs closely associated with attitudes, it is posited that individuals with high AC levels will develop more favorable attitudes toward adopting specific behaviors. Additionally, the correlation between PN and ATT highlights the importance of significant others' beliefs and willingness to conform, serving as crucial sources of an individual's internal moral guidance. Whether positive or negative, ATT significantly influences individuals' capability, confidence, and self-assurance. Furthermore, perceived behavioral control (PBC) was identified as exerting the second-largest overall impact. The analysis suggests that individuals are more likely to engage in behaviors in response to the COVID-19 pandemic when they perceive themselves as capable of participating.

CONCLUSION

Based on the research results, it is concluded that personal attitude and agency influence the mother's intentions in preventing stunting. They intend to take preventive action because of their positive views and belief in the importance of stunting prevention. There's a direct influence between a mother's knowledge, habits, and intentions about stunting and the behavior of the mother's parents in preventing stunting. A good understanding supported by high intentions and good habits will enable the mother to implement stunting prevention behavior in a child aged 0-24 months. So, it requires effort to improve the mother's knowledge, attitudes, intentions and habits through family empowerment.

Declaration of Interest

The authors declare no conflicts of interest.

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Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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