



Determinants of Infant Growth and Development Based on the Health Promotion Model

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Abstract

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BACKGROUND: The quality of future generations is largely determined by the growth and development of toddlers. All parents want their children to grow and develop optimally.

AIM: The purpose of this study was to identify the determinants of growth and development of infants aged 3–12 months based on the Health Promotion Model (HPM).

METHODS: The study used a cross-sectional study design, which was conducted at the Banyuwangi District Health Center. Respondents in this study were mothers who had infants aged 3–12 months as many as 217. The sampling technique used was random sampling. The independent variables using the components of the HPM theory are mother's motivation, infant's gestational age, perceived benefit, perceived barrier, perceived self-efficacy, and activity-related affect. The dependent variable is growth and development. Growth assessment is obtained from the BB/U value and compared with the z-score table. Developmental assessment was done using Pre-screening Development Questionnaire. The relationship between each independent variable and the dependent variable was analyzed using the Chi-square test. Determinants of growth and development of children under five were analyzed using multiple logistic regression.

RESULTS: The results of the independent variable logistic regression test with growth showed that the variable with $p < 0.05$ was the mother's perceived self-efficacy with $p = 0.013$. While the independent variable logistic regression test with development showed that the variable with $p < 0.05$ was the mother's perceived barrier with a $p = 0.000$.

CONCLUSION: Based on the HPM approach, it was found that the determinant of infant growth was the mother's perceived self-efficacy, while the determinant of infant development was the mother's perceived barrier. The growth and development of toddlers can be achieved optimally through efforts to increase the mother's perceived self-efficacy and reduce the mother's perceived barrier.

Introduction

The motor development of toddlers in the first 2 years of life is a very important stage of development and is an indicator of general human well-being and abilities. Motor skills in adulthood are a reflection of motor success at toddler age [1]. Growth in toddlerhood occurs very quickly but the pattern of growth in the future can be predicted. If there is a growth disorder in children, parents must evaluate the child's food intake. In toddlerhood, there is a critical period in which if the toddler is malnourished, it will cause permanent growth disorders, which even though in the future parents try to meet the nutritional needs of children optimally, this cannot change the condition of children who have experienced disorders such as stunting [2].

The incidence of stunting in toddlers in 2000 decreased from 198.4 million children under five (32.6%) to 150.8 million children under five in 2017 decreased (22.2%). Stunting in Asia has decreased from 38.1% to

23.3% [3]. Stunting in children in developing countries occurs at the age of under 5 years [4]. In 2017, there were 151 million children under five in the world (22%) experiencing stunting (growth below their average age). About 75% of them are from Southeast Asia or Africa. The high incidence of stunting has a negative impact on human development in general with the risk of morbidity and mortality in children, children's intelligence, and the risk of non-communicable diseases in future stages of life. Globally, in 2017, there were 51 million children under five (7.5%) experiencing wasting (very low body weight), while 38 million children under five in the world (5.6%) were obese (excess weight) [5]. Malnutrition in toddlers accompanied by lack of stimulation is the main risk factor for delayed development of toddlers in motor, cognitive, social behavior, and school achievement aspects [6].

Providing adequate nutrition with responsive parenting according to the child's developmental stage has a good influence on early childhood development [7]. Parents are always looking for information on how to properly raise children [8]. Health education can prevent

mothers from giving solid food early [9]. A child really needs play activities that will facilitate the development of children's cognition [10]. Families need guidance on the importance of providing developmental stimulation to children [11]. If developmental problems are detected early, children can be given more effective treatment, so that further developmental deficits can be prevented [12]. There is a lot of data that show the importance of parental guidance in raising children up to their adolescent [13].

Mother's behavior in fulfilling children's nutrition can be evaluated by using the Health Promotion Model (HPM) theory approach. The use of HPM in this study is a theoretical perspective that explores the factors and their relationship in health promotion efforts aimed at improving health through improving maternal behavior in optimizing child growth and development. HPM helps nurses understand the determinants of maternal health behavior in meeting child nutrition and developmental stimulation. HPM is a guide for nurses to explore the complex biopsychosocial process, which motivates mothers to meet the nutritional and developmental needs of their children [14].

Methods

Research design

This type of research is analytic observational. Researchers try to explain the research variables and examine the relationship between variables to gain an understanding of the phenomenon under study. The analysis of factors related to the growth and development of infants aged 3–12 months with a theoretical approach to the HPM is described in the Figure 1 below:

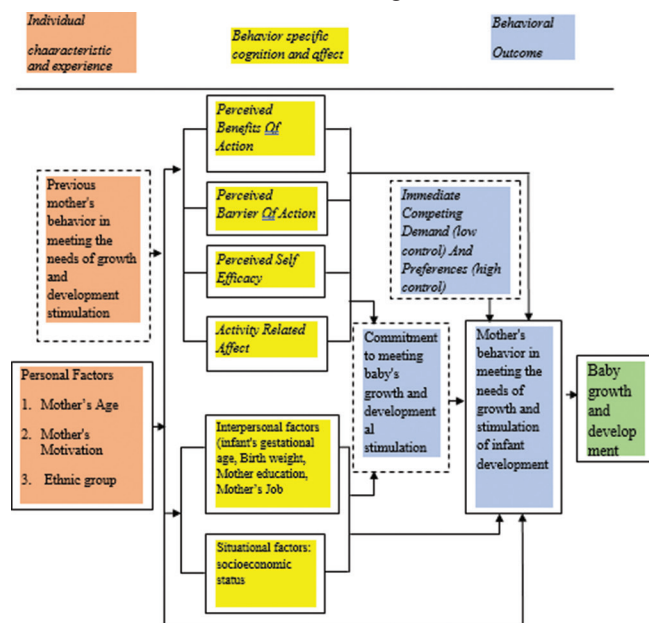


Figure 1: Determinants of maternal behavior in fulfilling infant growth and development based on the health promotion model

Setting and sample

The samples involved in this study were mothers with babies aged 3–12 months who met the criteria totaling 217 who were collected from the Banyuwangi Regency Health Center in 2020 with a random sampling technique.

Measurement and data collection

The independent variables include mother's motivation, baby's gestational age, perceived benefit, perceived barrier, perceived self-efficacy, and activity-related affect. The dependent variable is growth and development. Independent variables were collected using a questionnaire. Assessment of infant growth is carried out by measuring body length (PB), compared to the WHO-NCHS standard data on the PB/U index. Assessment of infant development was done using Pre-Screening Development Questionnaire.

Data analysis

Data analysis includes descriptive statistics and inferential statistics. Descriptive analysis is used to provide a description of the data collected and presented in tabular form. Chi-square test to determine the relationship of each independent and dependent variable. Multivariate analysis to determine the dominant factors associated with growth and development of infants with multiple logistic regression test.

Ethical considerations

This research has passed the health research ethics review with No. 450/KEPK/STIKES-BWI.

Results

General characteristics of respondents are based on Table 1. It is known that most respondents aged >25 years with an average age of 29 as many as 153 (71%) respondents, education of most high school education as many as 177 (81.56%) respondents, most of the work not working as many as 156 (71.8%), birth weight in infants found that almost all of them weighed 2500–4200 g by 201 (93%) respondents, gestational age was mostly 37 weeks as many as 189 (87%) respondents and baby growth data showed that most of the 124 (57%) infants had good nutrition status.

The results of the chi-square test analysis showed that the variables with $p < 0.05$, namely the mother's perceived self-efficacy with $p = 0.000$, baby's gestational age with $p = 0.000$, activity-related affect with $p = 0.001$, perceived barrier with $p = 0.002$, and

Table 1: General characteristics of respondents

Mother's characteristic and experience	f (%)	Mean ± SD
Personal Factor		
Mother's Age		
≤25 years	64 (29)	29 ± 5.57
>25 years	153 (71)	
Mother's motivation		
Strong	118 (54)	
Weak	99 (46)	
Ethnic group		
Java	48 (22)	
Non Java	169 (78)	
Behavior specific cognition and affect		
Perceived benefits of action		
Positive	112 (52)	
Negative	105 (48)	
Perceived barrier of action		
No obstacles	76 (35)	
There are obstacles	141 (65)	
Perceived self-efficacy		
Strong	108 (49.7)	
Weak	109 (50.2)	
Activity-related affect		
Strong	120 (55)	
Weak	97 (45)	
Interpersonal factors		
Infant's gestational age		
<37 weeks	28 (13)	37.2 ± 1.83
37–42 weeks	189 (87)	
Birth weight		
<2500 g	16 (7)	2926 ± 385.12
2500–4200 g	201 (93)	
Mother education		
Primary school	8 (3.68)	
Junior high school	8 (3.68)	
Senior High School	177 (81.56)	
College Graduate	24 (11.05)	
Mother's job		
Housewife	156 (71.88)	
Mother as employee	61 (28.11)	
Situational factors: socioeconomic status		
Monthly Income		
1.000.000–3.000.000	149 (68.6)	1203000 ± 616555.75
< 1.000.000	68 (31)	
Mother's behavior in meeting the needs of growth and stimulation of infant development		
Good	168 (77)	
Not enough	49 (23)	
Infant growth		
Good nutrition	124 (57)	
Malnutrition	64 (30)	
Very malnutrition	29 (13)	
Infant development		
Appropriate	136 (62.6)	
Suspect	73 (33.6)	
Irrelevance	8 (3.8)	

mother's motivation with a p value of 0.005 which means that these variables have a relationship with growth. The results of the logistic regression analysis showed that the variable that had a p < 0.05 was the mother's perceived self-efficacy with a p = 0.013 and an OR value of 3.731 95% CI 1.318–10.562 which means that the mother's perceived self-efficacy is the most important factor. Dominant in optimizing the growth of infants aged 3–12 months compared to other factors. Perceived benefit variable, perceived barrier, mother's motivation, activity-related affect have p > 0.05 which means that these variables are confounding factors. Data on infant development showed that 62.6% of

Table 2: Results of logistic regression analysis of risk factors related to the development of infants aged 3–12 months in Banyuwangi 2020

No	Variable	B	S.E.	Wald	df	p-value	OR	95% CI	
								Min	Maks
1.	Gestational age	1.300	0.487	7.117	1	0.008	3.671	1.412	9.544
2.	Motivation	-0.812	0.634	1.643	1	0.200	0.444	0.128	1.537
3.	Perceived benefit	0.128	0.594	0.046	1	0.830	1.136	0.355	3.640
4.	Perceived barrier	1.956	0.541	13.086	1	0.000	7.071	2.450	20.404
5.	Perceived self-efficacy	1.023	0.542	3.558	1	0.059	2.781	0.961	8.048
6.	Activity-related affect	-0.593	0.639	0.863	1	0.353	0.553	0.158	1.932

infants had appropriate development. The results of the chi-square test analysis show that the variables that have a p < 0.05, namely the perceived barrier with p = 0.000, gestational age with p = 0.000, maternal perceived self-efficacy with p = 0.012, which means that these variables have a relationship with development.

The results of the logistic regression analysis based on Table 2 show that, the variable that has a p < 0.05 is a perceived barrier with a p = 0.000 and an OR value of 7.071 95% CI 2.450–20.404; this indicates that mothers who do not perceive obstacles in doing stimulation development of infants aged 3–12 months are a factor that has a major influence in optimizing the development of infants aged 3–12 months compared to other factors. The variables, mother's motivation, perceived benefit, perceived self-efficacy, activity-related affect, have p > 0.05 which means that these variables are confounding factors.

Discussion

Researchers conducted data collection on mothers who have babies 3–12 months from the Banyuwangi District Health Center. Next, the researchers recorded the addresses of each respondent and asked for help from field assistants to determine the schedule of meetings with respondents. Based on the results of multivariate analysis using logistic regression, it was found that the mother's perceived self-efficacy was the dominant variable associated with the growth of infants aged 3–12 months that a mother with a positive perception of self-efficacy in relation to the fulfillment of nutrition for infants aged 3–12 months will prevent growth disorders of infants aged 3–12 months by 3.731 times higher than mothers who have a negative perception of self-efficacy and their behavior will be more positive. So that the baby can achieve optimal growth at the next stage of age. The mother's self-efficacy perception factor was followed by the baby's gestational age factor with a p = 0.017. The achievement of optimal health status is inseparable from the role of the family as part of the health service system in the community. Families have a very important role in achieving the health status of their family members in terms of providing support, both emotional support and other support, including efforts to achieve optimum health status in children [15]. The early stages of a child's life begin when a newborn is born until it reaches the age of 24 months. This period is often referred to as the golden age and is a period that is vulnerable to bad influences from the outside environment. Having a newborn baby is a learning moment for a mother who will change her lifestyle and daily habits for the health of her baby [16]. Mother's perceived self-efficacy in meeting the nutritional needs

of children to achieve optimal child growth is closely related to the mother's perceived self-control [17]. In this study, most of the mothers had a high school education level (81.56%). According to Fitri *et al.* [18], mothers who have a high level of education tend to be easy to understand and absorb wider information in the parenting process, which will have an impact on the child's growth and development. Community-based interventions affect children's growth [19]. According to Wahyuningrum *et al.* [20], mother's education is related to familiarizing children in meeting personal hygiene needs including personal hygiene before going to bed so that children will get used to living clean. Mother's perception of self-efficacy in meeting the nutritional needs of children is the indicator that will determine the success of efforts to optimize child growth. Respondents who were 30 years old most perceived that they did not experience obstacles in meeting the development needs of babies. Mothers who are in that age range have a lot of positive perceptions of something that benefits children's health because in general mothers have maturity and maturity in thinking. In toddlerhood, both macronutrients and micronutrients are needed for rapid growth and development [21]. Most of the respondents are housewives where housewives have more time for their children, they can regulate their children's diet and give more breast milk so that their children eat healthy and nutritious food [22]. Breastfeeding can have an effect through physical and emotional contact between mother and baby during breastfeeding [23]. Based on the results of the study, there is a relationship between breastfeeding along with complementary foods and stunting. Infants aged more than 6 months who are breastfed without complementary foods are at risk of stunting [24]. The provision of complementary foods for breastfeeding can be maximized to meet the body's metabolic needs, especially in malnourished children [25]. Based on the results of multivariate analysis using logistic regression, it was found that the mother's perceived barrier is the dominant variable associated with the development of infants aged 3–12 months, the perceived barrier with a $p = 0.000$, and an OR value of 7.071 95% CI 2.450–20.404 which has a statistical meaning that mothers who perceive the absence of obstacles in stimulating the development of infants aged 3–12 months will prevent developmental disorders of infants aged 3–12 months by 7.071 times higher than mothers who perceived obstacles in providing developmental stimulation so that babies can achieve optimal development at the next age stage. The mother's perceived barrier factor was followed by the baby's gestational age factor with a $p = 0.008$. Social and emotional development at infancy is the foundation for development at later stages such as toddler, preschool, and school age [26]. The greatest progress will occur when the steps of a toddler's social and emotional development are clearly defined [27]. Children's eating habits are very dependent on the food given by their parents [4]. Perceived barrier is

Table 3: The results of the analysis of the relationship of risk factors with the growth of infants aged 3–12 months in Banyuwangi 2020

No	Variable	B	S.E.	Wald	df	p-value	OR	95% CI	
								Min	Max
1.	Motivation	0.550	0.593	0.862	1	0.353	1.734	0.543	5.539
2.	Perceived Benefit	0.399	0.601	0.442	1	0.506	1.491	0.459	4.839
3.	Perceived Barrier	0.710	0.539	1.736	1	0.188	2.035	0.707	5.853
3.	Perceived Self Efficacy	1.317	0.531	6.149	1	0.013	3.731	1.318	10.562
4.	Activity Related Affect	0.338	0.609	0.308	1	0.579	1.402	0.425	4.628
5.	Gestational Age	1.191	0.498	5.710	1	0.017	3.290	1.239	8.736

defined as the perception of obstacles to carrying out certain health behaviors [14]. Barriers for stimulation of infant development include lack of knowledge about the stages of child development, no time and no educational game tools. The barriers that are most perceived by mothers in the behavior of meeting the developmental needs of infants include mothers not understanding the stages of development at each age and the lack of ability to choose tools and materials to stimulate child development. Based on these results, it is necessary to increase the ability to overcome obstacles in stimulating development in infants, so that the perceived barrier felt by the mother is low. One effort that can be done is to form peer group discussions as a medium for exchanging information and experiences of mothers in optimizing infant development. Based on Table 3, perceived barrier has been shown to have a significant relationship with development in infants aged 3–12 months with a $p < 0.05$ (0.000), which means that the more mothers perceive obstacles in the stimulation of infant development, it will directly affect the mother in choosing games and will indirectly affect the success of optimizing children's development as future generations.

Conclusion

Mother's self-efficacy in meeting the nutritional needs of infants has been shown to have a relationship with the growth status of infants aged 3–12 months, while the dominant variable related to the developmental status of infants aged 3–12 months is the mother's barriers to fulfilling the developmental stimulation of infants aged 3–12 months.

Suggestion

It is necessary to conduct counseling and training on optimizing the growth and development of children from an early age for mothers who have babies aged 3-12 months as an effort to anticipate disturbances and developmental delays in children.

References

- Boonzaaijer M, Oudgenoeg-Paz O, Suir I, Westers P, Nuysink J, Volman M, *et al.* Modeling a gross motor curve of typically developing Dutch infants from 3.5 to 15.5 months based on the Alberta Infant Motor Scale. *Early Hum Dev.* 2021;157:105366. <https://doi.org/10.1016/j.earlhumdev.2021.105366> PMID:33865116
- Mustapha RA, Bolajoko OO. Growth pattern and nutritional status of under five children in owo local government area of ondo state, Nigeria. *IOSR J Pharm Biol Sci.* 2013;5(4):106-9. <https://doi.org/10.9790/3008-054106109>
- Hasanah U, Maria IL, Jafar N, Hardianti A, Mallongi A, Syam A. Water, sanitation dan hygiene analysis, and individual factors for stunting among children under two years in ambon. *Open Access Macedon J Med Sci.* 2020;8(T2):22-6. <https://doi.org/10.3889/oamjms.2020.5177>
- Bustami B, Ampera M. The identification of modeling causes of stunting children aged 2-5 years in Aceh province, Indonesia (Data analysis of nutritional status monitoring 2015). *Open Access Macedon J Med Sci.* 2020;8(E):657-63. <https://doi.org/10.3889/oamjms.2020.4659>
- Mutiarasari D, Miranti M, Fitriana Y, Pakaya D, Sari P, Bohari B, *et al.* A determinant analysis of stunting prevalence on under 5-year-old children to establish stunting management policy. *Open Access Macedon J Med Sci.* 2021;9:79-84. <https://doi.org/10.3889/oamjms.2021.5622>
- Jimoh AO, Anyiam JO, Yakubu AM. Relationship between child development and nutritional status of under-five nigerian children. *South Afr J Clin Nutr.* 2018;31(3):50-4. <https://doi.org/10.1080/16070658.2017.1387434>
- Hurley KM, Yousafzai AK, Lopez-Boo F. Early child development and nutrition: A review of the benefits and challenges of implementing integrated interventions. *Adv Nutr.* 2016;7(2):357-63. <https://doi.org/10.3945/an.115.010363> PMID:26980819
- Thygesen LC, Koushede V, Sjo C, Axelsen F, Winkel P, Lindschou J, *et al.* Antenatal small-class education versus auditorium-based lectures to promote positive transitioning to parenthood-a randomised trial. *PLoS One.* 2017;12(5):e0176819. <https://doi.org/10.1371/journal.pone.0176819> PMID:28464006
- Kuo AA, Inkelas M, Slusser WM, Maidenberg M, Halfon N. Introduction of solid food to young infants. *Matern Child Health J.* 2011;15(8):1185-94. <https://doi.org/10.1007/s10995-010-0669-5> PMID:20842523
- Wilujeng AP, Trianita D, Indriani N. Pengaruh anticipatory guidance terhadap pertumbuhan dan perkembangan bayi usia 0-6 bulan. *J Keperawatan Muhammadiyah.* 2020;5(1):11-8. <https://doi.org/10.30651/jkm.v5i1.3325>
- Council on Early Childhood; Council on School Health. The pediatrician's role in optimizing school readiness. *Pediatrics.* 2016;138(3):e20162293. <https://doi.org/10.1542/peds.2016-2293> PMID:27573085
- Moodie S, Daneri P, Goldhagen S, Halle T, Green K, LaMonte L. Early Childhood Developmental Screening: A Compendium of Measures for Children Ages Birth to Five (OPRE Report 2014-11). Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services; 2014.
- Partridge B. Adolescent pediatric decision-making : A critical reconsideration in the light of the data. *HEC Forum.* 2014;26(4):299-308. <https://doi.org/10.1007/s10730-014-9250-8> PMID:25194336
- Pender N. *Health Promotion Models.* Rehabilitation. Berlin, Germany: ResearchGate; 2006. p. 131-46. <https://doi.org/10.1016/B978-0-443-10024-6.50010-4>
- Setyawan AB. Hubungan antara berat bayi lahir rendah dengan tumbuh kembang anak usia dini. *Ann Budi Setyawan.* 2017;3(2):83-91.
- French GM, Nicholson L, Skybo T, Klein EG, Schwirian PM, Murray-Johnson L, *et al.* An evaluation of mother-centered anticipatory guidance to reduce obesogenic infant feeding behaviors. *Pediatrics.* 2012;130(3):e507-17. <https://doi.org/10.1542/peds.2011-3027> PMID:22891225
- Songwathana P, Petpichetchian W, Sciences H. Concept analysis of perceived control. *Nurse Media J Nurs.* 2011;1(2):225-43. <https://doi.org/10.14710/nmjn.v1i2.973>
- Fitri DI, Chundrayetti E, Semiarty R. Artikel penelitian hubungan pemberian ASI dengan tumbuh kembang bayi umur 6 bulan di puskesmas nanggalo. *J Kesehatan Andalas* 2014;3(2):136-40.
- Blake-Lamb TL, Locks LM, Perkins ME, Baidal JA, Cheng ER, Taveras EM. Interventions for childhood obesity in the first 1,000 days a systematic review. *Am J Prev Med.* 2016;50(6):780-9. <https://doi.org/10.1016/j.amepre.2015.11.010> PMID:26916260
- Wahyuningrum E, Yulianti NR, Gayatina AK. Factors affecting sleep problems in preschoolers. *Nurse Media J Nurs.* 2020;10(2):107-18. <https://doi.org/10.14710/nmjn.v10i2.26649>
- Wilujeng AP, Reza IG, Ranuh G, Yunitasari E. The Risk Factors of Anemia in Children Malnourish Based Health Promotion Model. Repository Universitas Airlangga; 2015. p. 109. Available from: <https://www.repository.unair.ac.id/id/eprint/152>. [Last accessed on 2015 Aug 13].
- Mariyana R, De Kock SF. Hubungan Riwayat Prematur Dengan Tumbuh Kembang. *J Hum Care.* 2018;3(3):183-8.
- Julianti E, Elni E. Determinants of stunting in children aged 12-59 months. *Nurse Media J Nurs.* 2020;10(1):36-45. <https://doi.org/10.14710/nmjn.v10i1.25770>
- Nur R, Rusydi M, Fajriah RN, Larasati RD, Fitriyah SI, Hendra S, *et al.* Effects of family planning and baby care behavior on stunting in early married couples. *Open Access Macedon J Med Sci.* 2021;9:467-73. <https://doi.org/10.3889/oamjms.2021.5908>
- Nadimin N, Theresia Dewi KB, Salam A, Adam A. Local snacks and virtual nutrition counseling services increasing growth of stunting children. *Open Access Macedon J Med Sci.* 2021;9(B):331-6. <https://doi.org/10.3889/oamjms.2021.5875>
- Halle TG, Darling-Churchill KE. Review of measures of social and emotional development. *J Appl Dev Psychol.* 2016;45:8-18. <https://doi.org/10.1016/j.appdev.2016.02.003>
- Jones SM, Zaslow M, Darling-Churchill KE, Halle TG. Assessing early childhood social and emotional development : Key conceptual and measurement issues. *J Appl Dev Psychol.* 2016;45:42-8. <https://doi.org/10.1016/j.appdev.2016.02.008>