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The Influence of Maternal Characteristics and Nutritional Status on Toddler Development: Literature Review

Nurul Fitriani[1*], Rostika Flora[2], Mohammad Zulkarnain[2], Nur Alam Fajar[3], Elvi Sunarsih[3], Anita Rahmiwati[3]

[1]Program Studi Ilmu Kesehatan Masyarakat, Fakultas Kesehatan Masyarakat, Universitas Sriwijaya, Palembang

[2,3]Fakultas Kesehatan Masyarakat, Universitas Sriwijaya, Palembang

* Corresponding Author: fitriani.nrl96@gmail.com

ABSTRACT

Introduction: The first five years of a child's life are a time of peak development. According to the global prevalence, 52.9 million children under the age of five suffer from developmental problems. Parental involvement in monitoring their children's development will rise if parents have greater education, have a high level of knowledge, higher socioeconomic level, income, and the mother does not work. In addition, toddlers with good nutritional status will optimise their development.

Objective: This literature review aims to identify how maternal characteristics and nutritional status impact toddler development.

Method: This study is a systematic review by searching the literature through Google Scholar, Science Direct, and PubMed. Articles in Indonesian and English published from 2016 to 2022. Article searches used keywords or Boolean operators (AND - OR), some of the keywords used to search the literature included combinations of “development” OR “education” OR “income”’ OR “knowledge” OR “occupation” OR “nutritional status”, “education” AND “development”, “income” AND “development”, “knowledege” AND “development”, “occupation” AND “development”, “nutritional sataus” AND “development”.

Result: The results of this study showed that maternal characteristics such as education level, knowledge, occupation, and family income, as well as nutritional status affect the development of toddlers.

Conclusion: Knowing the interaction between maternal role and nutritional status can help optimise the development of toddlers according to their age.

Keywords: Development; Education; Income; Knowledge; Occupation; Nutritional Status

INTRODUCTION

Toddlers are considered the "golden age" of life and require extra attention. The first five years of a child's existence are a time of tremendous development and progress. Rapid growth and development encompass physical, psychomotor, mental, and social aspects(1). According to the global prevalence, 52.9 million children under the age of five suffer from developmental problems, with 95% living in low- and middle-income countries(2). In Indonesia, child development remains a major concern, with approximately 5%-10% enduring developmental delays. Two newborns per 1.000 have delayed motor development, 3 to 6 have hearing impairment, and one in 100 has intelligence deficiencies and communication difficulties(3).

Based on data from the Indonesian Health Survey (IHS) in 2023, the national prevalence of underweight children under five years old based on the WAZ index was 12.9% and stunting based on the HAZ index was 17.8% (4). Several studies have found that stunting and underweight are associated with child development, especially in motor, cognitive, and language development (5,6). One extremely significant indicator to determine the degree of public health is nutritional status, especially the nutritional status of children aged 1 to 5 years. Children of this age still need adequate nutritional intake to maintain good growth and development(7). The purpose of nutritional status assessment is to determine whether a child is well-nourished or malnourished. The assessment of nutritional status comprises the review of information relating to demographics, anthropometric measurements, biochemical assessments, clinical health symptoms, and dietary habits(8).

Child development is also linked to parental involvement in monitoring their children's growth and development. Parental involvement in monitoring their children's growth and development will rise if parents have greater education, older, have a high level of knowledge, have a higher socioeconomic level, income, and the mother does not work(9). The level of education is related to a person's knowledge. The level of education affects a person's ability to receive information. Low levels of maternal education have an impact on mothers' limited knowledge about healthy lifestyles and the importance of nutrition for toddlers, which affects their development(10). Family income also affects the growth and development of toddlers, where families who have higher incomes will spend money on the growth and development process of their children (9). In addition, non-working mothers will have more time with their children than working mothers, during the time with mothers and children, it is more likely for non-working mothers to interact, play and do games that can stimulate children's growth and development(11).

To determine optimal development, it is necessary to conduct growth and development screening. Early detection of child development is an activity aimed to uncover any anomalies in growth and development in children aged 0 to 6 years. Finding deviations in growth and development early, will accelerate appropriate interventions early on to overcome these deviations. If deviations are identified too late, interventions will be more difficult to implement and may be persistent and affect the child's growth and development(12). The Developmental Pre-Screening Questionnaire (KPSP) is one of the early detection questionnaires to determine child development. The interpretation of detection with KPSP is whether the child is normal or has deviations. The KPSP contains a list of questions addressed to parents or caregivers and is used as a tool for pre-screening child development from the age of 3 months to 72 months. KPSP screening should be routinely conducted at 3-month intervals, i.e. 3, 6, 9, 12, 15, 18, 21, 24, 30, 36, 42, 48, 54, 60, 66, and 72 months of age (13). It is hoped that this systematic review can identify maternal characteristics and assess the influence of nutritional status based on weight, height, and age on their physical, cognitive, and emotional development.

METHOD

This paper adopts a systematic literature review technique using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) scheme by collecting articles from electronic databases such as ScienceDirect, PubMed and Google Scholar. Article searches used keywords or boolean operators (AND - OR) to help search more specifically. Some of the keywords used to search the literature included combinations of “development” OR “education” OR “income”’ OR “knowledge” OR “occupation” OR “nutritional status”, “education” AND “development”, “income” AND “development”, “knowledege” AND “development”, “occupation” AND “development”, “nutritional sataus” AND “development”. Articles were reviewed to fulfil criteria focussing on under-five development. The selection criteria used were *full text open access* articles, original articles or original research published in international and domestic journals, articles in Indonesian and English published from 2016 to 2022. The exclusion criteria were articles in languages other than Indonesian and non-English, not *full text open access* articles, articles that do not focus on mothers and toddlers according to the themes of maternal characteristics, nutritional status, and development will be excluded, and studies that do not provide empirical data or reliable generalisations, such as editorials, opinions, or commentaries, will be excluded. A total of 766 articles were found in the initial search, these articles were then screened and re-analyzed and fourteen articles were selected and deemed to meet the inclusion criteria and selected for analysis. See the PRISMA flowchart below for the article selection process.

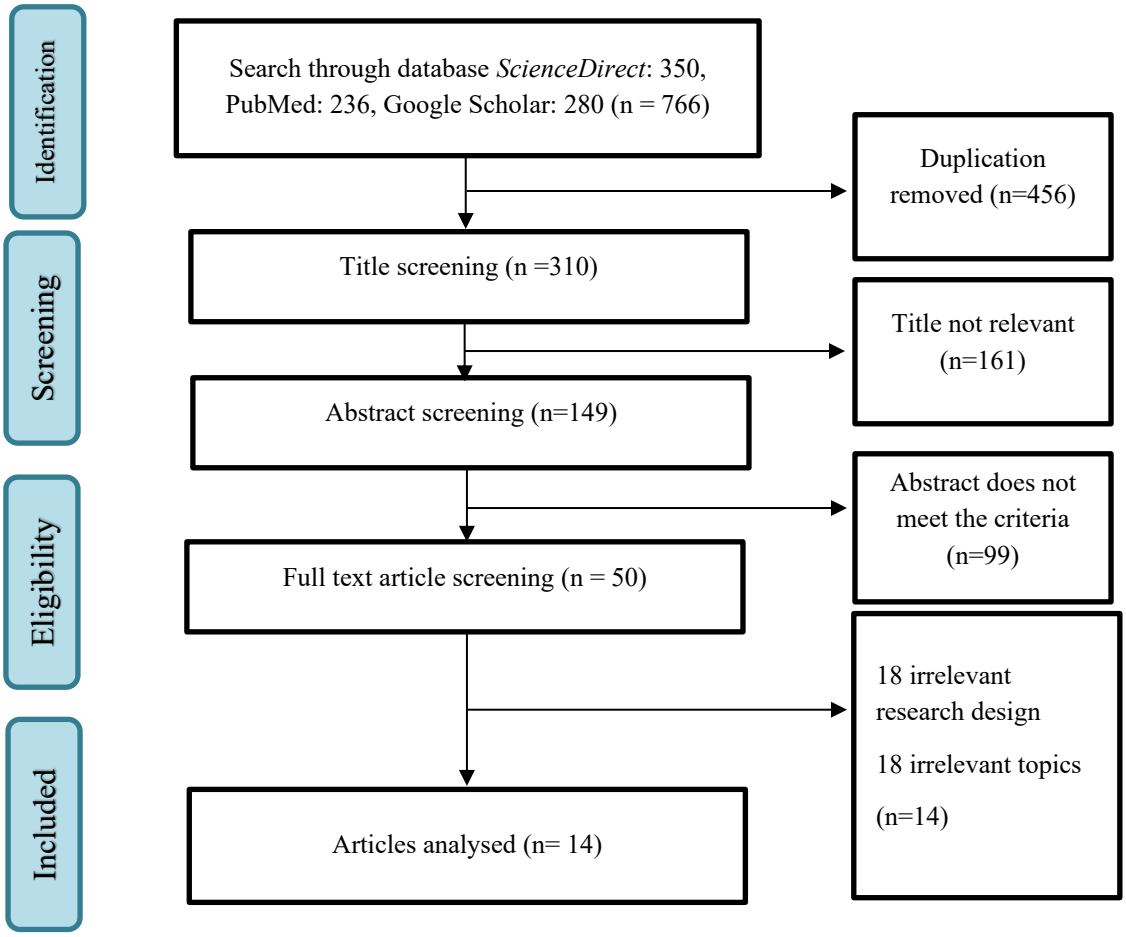

Figure 1. PRISMA Flow Diagram

RESULTS

The following fourteen articles were selected and fulfilled the inclusion criteria according to the purpose of this article literature review categorised by title, objectives, methodology and results from a total of 766 articles found in the initial search, a critical analysis of 14 research articles sampled in this review is outlined in Table 1 as follows.

Table 1. Reviewed Article

No	Title	Objective	Methodology	Results
Maternal Characteristics				
1	Parent Characteristics and Development of Toddlers 12-59 Months of Age (14)	Understanding the correlation between parental qualities and child development.	This is an analytical study using a cross-sectional technique. The sample comprised of 78 mothers and kids aged 12-59 months from Karayunan Village, with incidental sampling.	The study found that the majority of parents had limited education (elementary and junior high school), did not work, had a low income of < Rp850.000, and were primarily responsible for parenting. The findings of statistical studies indicate that there is a link between parental education, work, and income and toddler development.
2	Maternal features impacting the growth and development of infants under 5(9)	Understanding the features of mothers in tracking the growth and development of children at Babakan Sari Health Centre, Bandung.	Descriptive research using a cross-sectional design. The sample in this study used the incidental sampling technique, totalling 53 moms of toddlers.	The results showed that the characteristics of mothers were mostly at the age of 20-35 years (56.6%), education (SMA) (54.8%), high family income (50.9%), having children ≥ 2 (69.8%), and not working (83%). Statistical studies revealed a link

				between maternal features and monitoring toddler growth.
3	Mothers' qualities on developmental stimulation of preschool children aged 4-6 years old(15)	Knowing the relationship between age and mother's education in providing developmental stimulation for preschool children	Cross-sectional study with population criteria for children aged 4-6 years and a sample of 47 mothers and toddlers	The results of the study on children aged 4-6 years and their mothers with a total of 47 respondents each, the age of the mother of reproductive age recorded 37 (78.7%), the mother's education (senior high school) is 28 (59.6%), housewife as much as 33 (70.2%), and good maternal knowledge as much as 33 (70.2%) and the results of age development stimulation of 47 toddlers obtained 29 (61.7%) with toddlers appropriate category stimulation conditions. It can be concluded that most of the parent respondents (mothers) in this study have given developmental stimulation to their children well.
4	Motor Development and Associated Factors in Children Between 36 and 42 Months in The Low Amazon Region(16)	Analysing the relationship between socio-demographics and home environmental conditions with infant motor development	TThe study involved examining 300 toddlers aged 36 to 42 months who were enrolled in public early childhood education schools in the city of Parintins/AM, together with their parents or guardians. The data was collected using TMGD-2, AHEMD, and ABEP. The prevalence ratios (PR) were calculated using Poisson regression with hierarchical analysis.	The prevalence of developmental delays was 76%. Child gender and parental income were found to be statistically significant predictors of motor development. Boys faced a 31% higher chance of developmental delay than girls. Children from homes with income less than regional minimum wage were 1.77 times more likely to suffer developmental delays than children from families with monthly income equal to or greater than regional minimum wage.
5	Mediating pathways in the socio-economic gradient of child development: Evidence from children 6–42 months in Bogota(17)	Investigates the association between child development, household socioeconomic status (SES), and a collection of putative mediating variables: parental traits, child biomedical factors, and home environment quality.	The study used mediation tests to determine how the factors of interest contributed to the SES gap, as well as to investigate the influence of age, parental education, particularly maternal education, and home environment quality.	According to the study's findings, there is a gap in language development in toddlers, which is associated with mothers who are more educated providing stimulation to their children at home than mothers who are less educated, and the home environment influences maternal education.
6	Factors influencing developmental delay among young children in poor rural China: a latent variable approach(18)	Determine the prevalence of suspected developmental delay in children living in disadvantaged areas in rural China, as well as the factors affecting child developmental delay.	A community-based cross-sectional study was carried out in 83 villages in Shanxi and Guizhou Provinces, China. A total of 2514 children aged 6-35 months and their carers (parents, family, and carers) took part.	Overall, 35.7% of surveyed children aged 6-35 months had probable developmental delays. The prevalence of suspected developmental delay was inversely proportional to age, with children aged 6-11 months having nearly double the prevalence as children aged 30-35 months (48.0% and 22.8%, respectively). Parenting characteristics, stimulation, and child haemoglobin levels were directly correlated with development, while carer sociodemographic factors (age,

				education, and economic status) were indirectly related to under-five development.
Nutritional Status				
7	Relationship between child development and nutritional status of under-five Nigerian children(19)	Assessing the nutritional status of children under five and its impact on their intelligence development.	A cross-sectional study was carried out on 415 children aged 6-59 months in pre-kindergartens and health clinics. The Growing Skills II Schedule was used to conduct developmental assessments. Nutritional status was examined using WHO growth charts with WAZ, HAZ, and WHZ values.	The total prevalence of developmental delay was 35.4%, with manipulative conduct causing the most delay (25.8%). The prevalence of stunting, wasting, and underweight was 9.1%, 3.8%, and 3.8%, respectively, with 2.2% being overweight. Weight for age was significantly associated with the hearing, language, and socialisation domains. According to statistical testing, there was a link between nutritional status and development.
8	The Link Between Nutritional Status and Growth and Development Stimulation and Toddler Development(20)	This study examines the impact of nutritional status on the growth and development of children under the age of five in West Nusa Tenggara Province)	A cross-sectional observational research study was conducted. This study was done between February and April 2018. The sample was generated by simple random sampling of up to 114 research subjects	According to multivariate analysis results between nutritional status (HAZ) and developmental stimulation that affects development, the results showed p=0.003 for nutritional status and p=0.014 for developmental stimulation. Toddlers with normal stature had 3.3 times the odds of experiencing appropriate development compared to children with short and very short stature (stunting).
9	The link between nutritional status and developmental outcomes in toddlers aged 1-3 years(21)	Understanding the link between nutritional status and the development of toddlers aged 1-3 years	This study employed a correlation design and a cross-sectional technique. The population consists of all mothers and children aged 1-3 years living in Jaan Posyandu, Jaan Village, Gondang District, Nganjuk Regency. A complete sampling technique was used to gather a sample of 35 respondents.	The results of the study of 35 respondents found that most of the nutritional status of toddlers is good nutrition as many as 25 respondents (71.5%) with the development of appropriate toddlers as many as 23 respondents (65.7%). The findings of statistical testing revealed a link between nutritional status and child growth in the age range of one to three years.
10	Nutritional status and development of children aged 3-5 years in Bogor District (22)	To determine the relationship between nutritional status based on W/A, H/A, and W/H with gross motor development, fine motor development, passive communication, active communication, cognitive, self-help skills, and social behaviour of children aged 3-5 years.	The design of this study was a cross-sectional study involving 120 children aged 3-5 years. The location and subjects were purposively selected in Bogor Regency. Children's nutritional status was assessed based on the W/A, H/A and W/H indices. Child development was assessed using the Bina Keluarga Balita (BKB) questionnaire.	The majority of the subjects had good nutrition and development. The nutritional status based on W/A was substantially linked with gross motor and cognitive development. H/A nutritional status has a significant impact on gross motor, active communication, and cognitive development. W/H dietary status was substantially related to children's fine motor and cognitive development.

11	Relationship between Nutritional Status and Cognitive Development in 6-24 Months Old Children (23)	Understanding the link between dietary status and cognitive development in children aged 6-24 months.	A cross-sectional analysis method. The study's sample size was 67 people chosen by sequential sampling who met the inclusion criteria in the Gianyar I Health Centre operating area between March 2021 and May 2021.	The findings indicated that well-nourished children had good cognitive development (93.3%). Suspected cognitive developmental problems were more common in children with low dietary status (85.7%). There is an association between dietary status and cognitive development in youngsters.
12	Child development and nutritional status in 12–59 months of age in resource limited setting of Ethiopia(24)	Investigate children's development in relation to their nutritional status.	A cross-sectional study carried out in the community. In 2015, 626 children aged 12-59 months with mothers/caregivers from Wolaita District were selected using a rigorous random sample technique. The age and developmental stage questionnaire, third edition, was used to examine children's development. Height and weight were taken to establish nutritional status.	Children's developmental delays accounted for 19.0% of the overall sample, including 5.8% communication/language delays, 6.1% gross motor, 4.0% fine motor, 8.8% socialisation, and 4.1% problem solving. One-third (34.1%) of the participants in the research were stunted, with 6.9% and 11.9% being underweight, respectively. Weight-for-age (WAZ) and height-for-age were found to have a favourable correlation with all five developmental domains: communication, gross motor, fine motor, socialisation, and problem solving.
13	Correlation of nutritional status and nutritional parenting methods with the growth of children aged 6-24 months (25)	Understanding the impact of dietary status and parenting behaviours on the development of children aged 6-24 months.	The cross-sectional approach of analytical observational research was adopted in this study. A simple random selection procedure was used to choose 160 children aged 6-24 months for the study.	According to the WAZ index, 92.5% of people had good nutrition, 76.5% had good HAZ, 86.9% had good WHZ, and 46.3% had strong nutritional parenting. The development of children aged 6 to 24 months in the working area of Puskesmas Banyuurip, Purworejo Regency, was 81.9% normal, 12.5% questionable, and 5.6% unknown. The relationship between nutritional status according to the index WAZ, WHZ, and nutritional parenting ($p = 0.000$) and child growth.
14	Association between nutritional status with growth and development of children under the age of three(26)	Understanding the association between nutritional status and growth and development of toddlers aged 1-3 years old at Palapa Health Centre, Bandar Lampung in 2019.	Quantitative research was conducted using a cross-sectional approach with a population of women who had toddlers aged 1-3 years at Palapa Health Centre in Bandar Lampung, with a sample size of 203 toddlers drawn using random sampling with proportionate random sampling. Data is collected by observing toddlers and filling out a KPSP questionnaire.	There are 104 toddlers (51.2%) with enough nutritional intake, 134 toddlers (66.0%) with proper category growth, and 142 toddlers (70.0%) with development that does not vary. There is a link between nutritional status and the growth of toddlers aged 1-3 years (p value=0.001).

DISCUSSION

Relationship between Maternal Characteristics and Toddler Development

Development necessitates stimulation, particularly within the family, through the availability of toys, socialisation of the child, involvement of the mother and other family members in the child's activities(27). If the child experiences a lack of stimulus, it will experience perceptual deprivation, which means the child is inhibited in its development, experiencing retardation and developmental disorders. The role of stimulation will be influenced by various factors, one of the most important factors is the mother or permanent caregiver. The mother or permanent caregiver also determines the success or delay of the child's development (14).

Based on several studies that have been conducted, education, knowledge, employment and family income are factors that can affect the development of toddlers(9)(15). A mother's education affects her child's development (9,14,15,17,18). Education is a human effort to gain experience in the form of additional knowledge. Along with the increasing level of education taken, the maturity and ability of a person to absorb and digest the information obtained also develops. Education is essential for obtaining health-related information and enhancing quality of life(15). Mothers with higher education are more likely to apply good nutrition and feeding practices to their children and they will experience better growth and development. Meanwhile, mothers with higher education will provide the best stimulation, education and nutrition so that they will have a lower risk of morbidity and mortality in childhood(9). Low levels of maternal education mean that mothers do not have sufficient knowledge and skills in developmental stimulation. Children with low-educated parents have a three times higher risk of developmental delays (28).

Knowledge, or cognitive, is a key domain for the creation of a person's behaviour; knowledge will induce changes in an individual's attitudes and actions; knowledge about an object can be learnt via experience, teachers, parents, and the media. Maternal knowledge has a major influence on the fine motor development of preschool children(15).

A mother's occupation is also a factor in her child's growth. The study's findings also revealed that toddler cared for by non-working moms had higher levels of linguistic expression and vocabulary than working mothers(15). Mothers who do not work will have more time with their children than working mothers. During this time, non-working mothers are more likely to engage, play, and do games that can encourage their children's growth and development(11).

Family income also plays an important role in toddler development(9,14). Family income is associated with delays in child motor development, delays are higher in low family income compared to higher family income(16). Families who have higer income level will try to meet the nutritional needs of children from the womb to birth, where at birth the family will also meet the needs of children ranging from nutrition to equipment and educational games for the child(9). In addition to the factors mentioned above, the age of the mother also affects the development of toddlers. The age of an individual illustrates the maturity of a person in determining everything from his life. The older they get, the more mature they will be in making choices for themselves or their families. Mothers in the thirty-year of age range is considered mature, so when educating and caring for children is more prepared than mothers under the age of 20, in the 30s mothers are considered capable of controlling emotions well, this has a good impact on child development because they can place and teach emotions well when educating their children(4).

Relationship between Nutritional Status and Toddler Development

Children require nutrients for proper growth and development. Children's nutritional status is affected by the foods they ingest. Differences in nutritional status have distinct consequences on each kid's development; if balanced nutritional demands are not addressed effectively, the attainment of child growth and development will be hindered(21,26). Children with poor nutritional status will experience cognitive delays(22,23,26), language delays, socialisation, gross motor, fine motor(19,20,22,25), and inability to solve problems(24), those with normal stature have a 3.3 times likelihood of enjoying appropriate development compared to those with short and very short stature (stunting)(20).

Undernourished children tend to be apathetic, due to the suboptimal performance of the central nervous system in receiving information or stimuli from the environment. In addition, undernourished children are at risk of decreased concentration, impaired intellectual development, low learning potential, increased risk of disease as adults, and poor work capacity in later life(24). Malnutrition has an impact on language development because malnourished children's auditory pathways mature later, affecting both central and peripheral hearing. Malnutrition, especially in its severe form, will impair the normal functioning of the middle ear and, potentially, the entire auditory system. These youngsters may have difficulties speaking(19). Children with poor nutritional status will experience decreased motor function associated with low mechanical ability of the triceps muscle which results in delayed muscle function maturity, causing children's motor skills to be inhibited(5). For motor activities, a significant amount of energy is needed. Actions like lying prone, crawling, standing, walking, and running involve mechanisms that consume high energy levels. Those suffering from energy deficiency, specifically children with Protein-Energy

Malnutrition (PEM), may experience delays in motor development. Malnourished children may have underdeveloped muscles involved in both gross and fine motor movements compared to adequately nourished children due to this energy deficiency. This condition also affects bone growth and the development of other organs, resulting in stunted physical growth (25).

Besides maternal characteristics and nutritional status, toddler development is also influenced by stimulation and the environment provided by the family. Stimulation has a significant influence on the development of toddlers, because appropriate stimulation can encourage optimal cognitive, physical, social and emotional development(18). Families influence the provision of a good physical environment, facilities and media such as play equipment according to the age of toddlers, safe household equipment, and free space for children to move when exploring their environment (29).

CONCLUSION

Toddler development is impacted by multiple factors, including maternal traits and nutritional status. Maternal attributes include education, knowledge, occupation, and family income are important factors impacting child development. A child's nutritional status has a substantial effect on multiple aspects of development; children with poor nutritional status are more susceptible to developmental delays in various areas, including decreased concentration, intellectual development issues, and delays in motor skill maturation and speech abilities. Understanding the interaction between maternal roles and nutritional status can help optimize toddler development in accordance with their age. Several interventions can be implemented in the community, providing accessible classes that cover nutrition, child development, and health literacy empowers mothers with knowledge to make informed decisions, these classes can be offered through healthcare facilities, community centers, or online platforms; improving health services for under-five growth and development at "posyandu" and health centre; developing environmental policies that support child stimulation such as providing safe playgrounds and open spaces, as well as affordable early childhood education facilities; improving the knowledge and skills of health cadres in providing developmental stimulation; educating mothers on local, affordable produce options and offering cooking classes can empower them to make nutritious meals on a budget; encouraging exclusive breastfeeding for the first six months and providing breastfeeding education is key; and community support for the importance of stimulation in child development can be encouraged through public health campaigns that focus on child growth.

SUGGESTION

This literature review highlights its main focus on maternal characteristics and nutritional status factors on toddler development. It is expected that further studies can examine other factors that influence delays in toddler development, such as genetic, environmental, social, cultural, nutritional, parental mental health, parenting patterns and technology.

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