

REVIEW

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The effect of mothers' nutritional education and knowledge on children's nutritional status: a systematic review

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Abstract

Malnutrition in children is a significant risk factor for child mortality and is a global health problem. One of the influencing factors is low economic factors and the mother's education. This study aimed to analyze the effect of mothers' nutritional education and knowledge on children's nutritional status: a systematic review. The literature examined in this literature review uses four databases, including Embase, ProQuest, PubMed, and Google scholar. The studies included the effect of nutrition education on maternal knowledge and children's nutritional status. Nutrition education impacted mothers' knowledge, attitudes, and skills ($p < 0.001$). The effect of nutrition education on mothers affects children's nutritional status, namely in the form of changes in the average birth weight of children, increasing 0.257 kg/0.26 kg compared with birth weight in the control group ($\beta = 0.257, p < 0.001$). Nutrition education has a significant impact on increasing maternal knowledge and children's nutritional status. Sharing various approaches can be done by providing nutrition education, brainstorming, and demonstrations. Nutritional health education methods and media can be in booklets, guidebooks, leaflets, and internet technology applications.

Keywords: Effect, Nutrition education, Mother, Children's nutritional status

Introduction

Nutrition education programs can help mothers' knowledge of fulfilling infants and toddlers (Muluye et al., 2020). Many health workers do nutrition education to help the community, especially mothers, prevent stunting (Black et al., 2020). One factor that influences mothers to experience malnutrition is low economic factors (Kassaw et al., 2020). When needs such as the food needed during pregnancy are unmet, it can cause stunting (Ariati, 2019).

Imbalanced nutrition during maternal pregnancy can affect malnutrition, and body failure conditions due to chronic nutrition can occur in infants and toddlers (Raiten & Bremer, 2020). The nutritional intake of children is very dependent on the food consumed by the mother, especially during pregnancy (Nurritzka et al., 2020). Stunting is chronic malnutrition due to insufficient food intake for a long time (Gilson et al., 2018). Mothers play an important role in household affairs, significantly raising children

(Sopiatun & Maryati, 2020). Fulfilling nutrition in mothers is an indispensable requirement in helping infants and children's growth and development process and preventing various diseases (Dhami et al., 2019).

In 2018, the number of children under five who were stunted in Asia was in the high category at 55% compared to Africa, only 39% (Ministry of Health Indonesia, 2019). According to the World Health Organization (WHO), data on the prevalence of children under five with stunting in 2018 in Indonesia was 36.4%, which is one of the three countries with the highest prevalence in Southeast Asia after Timor Leste (50.5%) and India (38, 4%). Meanwhile, based on Basic health research on 2018, in Indonesia, around 30.8% who experience stunting are children aged 24–59 months (Ministry of Health Indonesia, 2019).

Several studies have shown that nutrition education can improve maternal knowledge of stunting prevention. Research in Pakistan shows that mothers' ability to implement nutritional education using stunting diagnostic applications can educate mothers to diagnose stunting and teach the prevention of high-impact stunting in children (Ponum et al., 2020). A study in Bangladesh also advised mothers to follow proper nutrition counseling to community health workers to reduce stunting in children under five (Mistry et al., 2019). Research conducted in Semarang, Indonesia, on the effect of mobile-based nutrition education on increasing mothers' knowledge about stunting shows an increase in maternal knowledge (Setyawati & Kurniadi, 2019). There is an effect of nutrition education on increasing maternal knowledge in preventing stunting in toddlers. Providing nutrition education on maternal improvement affects minimizing stunting incidence (Abebe et al., 2016). This research complements and adds to the study's findings by conducting a literature review study.

Objective

This study aimed to analyze the effect of mothers' nutritional education and knowledge on children's nutritional status: a systematic review.

Method

The literature search in this literature review uses four databases included Embase, ProQuest, PubMed, and Google scholar. The keywords in this literature review are adjusted to the Medical Subject Heading (MeSH, Emtree), consisting of the following: "nutrition education" AND "status nutritional" OR "nutrition status" OR "status nutrition" AND "Maternal" AND "Knowledge" OR "Epistemology" AND "children" OR "child". The inclusion criteria used the PICOS format (Population, Intervention, Comparison, Outcome, Study design). Population refers to the study focus on nutrition education in mothers to prevent stunting; intervention refers to the nutrition education; comparison refers to that of the control and intervention group; result refers to the effect of nutrition education; and Research design is the Quasi-experimental study, control, and randomized trial. The publication range is from 2016 to 2021. Moreover, the articles were published in two languages namely English and Bahasa Indonesia. Besides, a list of relevant article references is searched for any articles that may have been missed on the initial search. Unsuitable articles have been excluded. The study received 2109 articles in total. The articles were selected using PRISMA (Preferred Reporting Items for Systematic Reviews

and Meta-analyses). Within a matrix framework, the article is analyzed using the Nvivo software package version 12 plus (QSR International Inc., Burlington, MA, USA). The steps of data analysis include coding data and processing the coding results. Data coding is done inductively by reading the data intensely, then determining the data classification. Processing the coding results by using the Explore and Run Query features which will produce a hierarchy chart (LP2M, 2020).

Research results

Respondent characteristics

The respondent' characteristics in 15 international journals include several respondents, research area, education level, occupation, and maternal age.

Most of the research areas were carried out in Indonesia, with 11 (73.33%) studies. The articles are found in many areas in Indonesia because the problem of stunting is currently the primary concern of the Indonesian government. According to a study by UNICEF Indonesia, various obstacles causes high rate of stunting children aged 6–23 months in Indonesia. The low education level is greater than the secondary and high education levels, which is 36.20%. Work status of mothers who work 72.71% and who do not work 27.29%. The age of younger mothers is more than older mothers, namely, 25–35 years as much as 36.22%, 18–24 years as much as 32.54%, then > 35 years as much as 31.24% (Table 1).

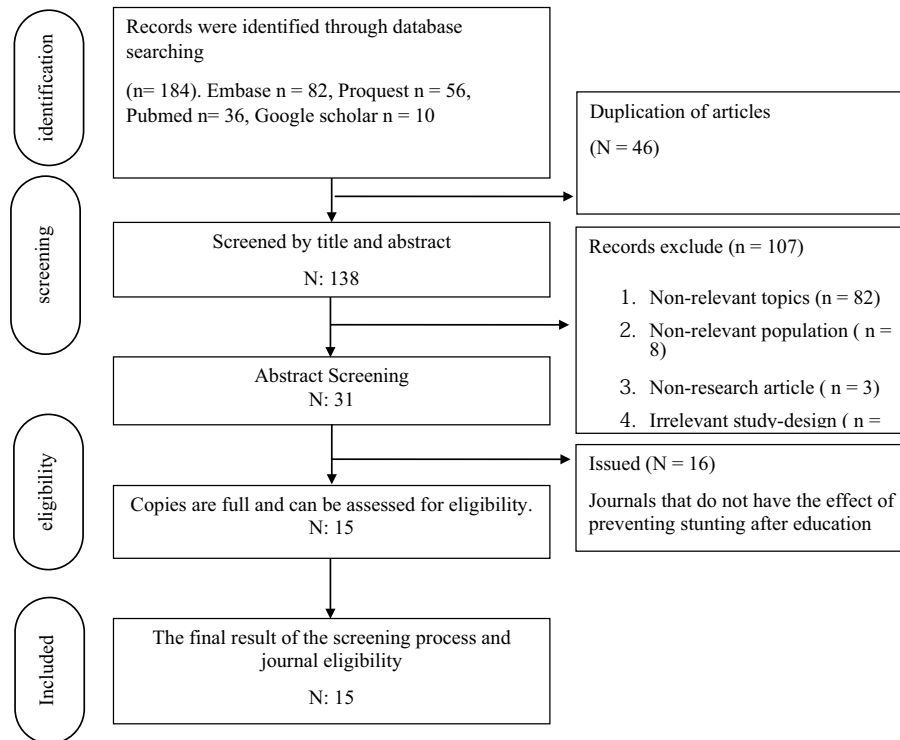
Variant nutrition education

By studying the benefits of consuming Moringa leaves, interventions in the form of nutrition education provided to mothers or parents can be found in Riti and Lewar, (2020). Nutrition education, in general, is also an intervention in the articles of Diddana et al., (2018), Demilew et al., (2020), Nurhayati et al., (2020), and Setia et al., (2020a). The intervention in the article by Yunitasari et al., (2020b) is in health education by providing

Table 1 Characteristics of respondents (n = 7109)

Characteristics	n	%
Journal research area		
Indonesia	11	73.33
USA	1	6.67
Pakistan	1	6.67
Ethiopia	2	13.33
Respondents education level		
Low	2,573	36.20
Intermediate	2,222	31.25
High	2,314	32.55
Respondent occupation		
Work	5,169	72.71
Does not work	1,940	27.29
Respondent age		
18–24 years	2,313	32.54
25–35 years	2,575	36.22
> 35 years	2,221	31.24

modules containing material coupled with peer group discussion sessions on stunting prevention. In addition, interventions in the form of book-based education on MCH (Maternal and Child Health) and audiovisual media from mobile applications were carried out for mothers with nutritional needs and child development. The material delivery uses the lecture method, image, and video media.



Interventions in education with the lecture method and booklet media are found in Suryati and Supriyadi (2019). Muluye et al., (2020) offer education with media posters, notebooks, brochures, and practical demonstration sessions. An intervention in stunting education using brainstorming and audiovisual methods is contained in the article by Wahyurin et al., (2019). In the article, Mahmudiono et al., (2018) provide direct intervention in nutrition education and with media in the form of printed material. In contrast to the article by Setyawati and Kurniadi, (2019), which provides intervention in the form of educational material in a smartphone application so that it can be accessed any-time and anywhere.

Effects of nutrition education on maternal knowledge

The intervention's effect significantly improves the health of both mother, parent, and child so that it can reduce the incidence of stunting in children. In addition, there is an impact of increasing knowledge by providing beneficial education on *Moringa oleifera* in mothers listed in Riti and Lewar, (2020). A study that confirms that giving *Moringa* can increase body weight in children is a study in Burkina Faso to compare the effect of *Moringa* powder supplementation on under 5-year-old children, which found that groups

receiving the Moringa supplement had a higher average weight gain (8.9 ± 4.3 g/kg/day, compared to 5.7 ± 2.72 g/kg/day in the non-receiving group) (Agedew et al., 2022).

There is also an increase in knowledge of premarital couples with a value ($p = 0.000$) in the article by Yunitasari and Rahayu et al., (2020b) to prevent stunting. Moreover, there is a significant effect on increasing maternal knowledge on interventions using the MCH book with a value ($p < 0.001$) in Sugiarti et al., (2020), and CBD education (lecture, brainstorming, demonstration) significantly affects maternal knowledge ($p = 0.000$) which can reduce stunting rates in children. Increased knowledge is also an impact of the existing interventions in the articles of Setyawati & Kurniadi A (2019) and Wahyurin et al., (2019) (Table 2).

A previous study showed that significant results were obtained that health education was effective in increasing mothers' knowledge so that it could help change maternal parenting patterns in providing nutrition which had a positive impact on increasing body weight in stunted toddlers, Nurhayati et al., (2020). The article by Diddana et al., (2018) found that education using the HBM theory of the Health Belief Model significantly affected maternal nutritional knowledge, increasing from 60.9 to 72.5% ($p < 0.001$). Knowledge, attitudes, and actions are also in the form of the impact of giving intervention; in the article by Setia et al., (2020a), changes in knowledge, attitudes, and behavior of poor women and pregnant women, ($p < 0.001$). In contrast to the article by Muluye et al., (2020), the provision of interventions impacts the form of knowledge and practice better to apply complementary foods to children (Table 2).

Effects of health education on children's nutritional status

The effect of nutrition education on the mother impacts the child's nutritional status in the form of changes in the child's average birth weight. For example, in the research of Demilew et al., (2020), there were changes in mean birth weight in the intervention group, which increased by 0.257 kg /0.26 kg compared with birth weight in the control group ($\beta = 0.257$, $p < 0.001$). As well as articles by Khan et al., (2020) there is an impact on children who received the wawamum 50 mg supplement were found to have a significantly reduced risk of stunting ($RR = 0.91$, 95% CI 0.88–0.94, $p < 0.001$) and wasting ($RR = 0.78$, 95% CI 0.67–0.92, $p = 0.004$). Wawamum (roasted chickpeas, vegetable oil, dry skimmed milk powder, sugar, micronutrients, emulsifier, and antioxidants) was given to children aged 6 to 23 months. During the 6–23 month age range, a daily ration of 50 g of Wawamum was provided to cover the recommended dietary allowances (RDA) of most micronutrients and a minimum of 255 kcal of energy (about 1/4 of daily energy requirements for children in this age range).

The impact of increasing body weight in children with stunting can be found in the article by Nurhayati et al., (2020). In addition, the last article by Mahmudiono et al., (2018) revealed the impacts increasing body weight and height of children with stunting (Table 3).

Discussion

Effects of nutrition education on maternal knowledge

The results showed that lectures, brainstorming, and demonstrations (LBD) could increase mothers' knowledge about stunting prevention. This increase in knowledge

Table 2 Effects of nutrition education programs on mothers

Author	Participants	Study design	Type of intervention	Instruments	Most important results
Sugiarti et al., (2020)	69 mothers, 23 in the intervention group, 23 in the control group	Quasi-experimental research design with a control group	The intervention is based on education MCH books (Maternal and Child Health) and audiovisual media from the mobile application that were conducted for two months for mothers in hospitals on the topic of nutritional needs and child development	Maternal confidence questionnaire (MCQ)	The MCH book-based learning significantly increased mothers' knowledge and confidence scores ($p < 0.001$). Who received their instructions from the mobile app ($p < 0.001$)
Yunitasari and Rahayu et al., (2020b)	70 mothers were divided into 35 in the control group and 35 in the intervention group	Quasi-experimental design	The intervention is in the form of counseling with CBD techniques (lecture, brainstorming, demonstration)	Demographic questionnaire, questionnaire of mother's knowledge and attitudes about stunting	The results have an influence on the knowledge and attitudes of mothers after being given CBD education with a p-value = 0.000 ($p < 0.05$)
Diddana et al., (2018)	A total of 138 pregnant women participated, 69 in the intervention group and 69 in the control	A Cluster Randomized Control Trial	Intervention using HBM: Health Belief Model theory was given 15 consecutive days for five months Nutrition counseling is provided by public health personnel. General nutrition education, which health educators usually do. Education is given at the start for three consecutive days	Nutrition knowledge questionnaires	The results showed an effect of increasing knowledge about nutrition in pregnant women after being given HBM with a value ($p < 0.001$)
Suryati and Supriyadi, (2019)	Mothers with stunting children were 90 respondents divided into the intervention group and the control group	Quasi-experimental design	The intervention was in the form of education using the lecture method and booklet media. At the same time, the other group received education using the lecture method without being given a booklet about stunting prevention	Mothers' knowledge questionnaire about toddler nutrition: measure the knowledge of mothers about child nutrition	The results showed an influence on the mother's knowledge, attitudes, and actions after giving the education booklet with a statistically significant value ($p = 0.0001$)

Table 2 (continued)

Author	Participants	Study design	Type of intervention	Instruments	Most important results
Mulye et al., (2020)	Two hundred (200) mother-child pairs (100 for each group) are recruited	<i>They randomized control trials</i>	Nutrition education is provided to children aged 6–23 months starting January–March 2014 and January–March 2017 in Amharic, the local language, by a trained nutritionist. Media posters, notebooks, brochures, and practical demonstration sessions are used during nutrition education	<i>Ethiopian and Health Survey (EDHS) 2016 infant and young child feeding (IYCF) questionnaires</i>	The results showed how providing nutrition education to mothers increases maternal knowledge about complementary feeding in childcare centers
Setyawati and Kurniadi, (2019)	28 Participant's mothers who were involved met the inclusion criteria: having a baby/toddler, owning an Android phone, and age less than 35 years	<i>Quasi-experimental design, one group pre-post test</i>	The intervention is in the form of educational material contained in the application, namely in the form of nutrition education for infants and toddlers, how to care for children and toddlers, and health problems regarding stunting	<i>Questionnaires to assess knowledge:</i> to assess knowledge about stunting. The questionnaire is divided into three parts: Information (age, education, socioeconomic status) attendance at the posyandu Questions about knowledge about stunting, the researcher gave 18 questions in the form of a questionnaire. If true, it was given a value of 1. If wrong, it was given a score of 0 to assess knowledge	The result of this study is that there is an increase in the average knowledge of mothers about stunting after receiving application-based education on nutrition android cellular with a value ($p < 0.0001$) from the paired t-test results
Wahyurin et al., (2019)	34 mothers who have stunting toddlers	<i>Quasi-experimental design</i>	The intervention was in the form of stunting education using brainstorming and audiovisual methods on the knowledge of mothers with stunting children. The intervention was carried out for 1–2 months	Data collection on maternal knowledge about stunting was obtained using a questionnaire after being given education using brainstorming and audiovisual. The value of maternal knowledge on the pre-test was 6.44 ± 1.65 , while the score on the post-test increased to 7.38 ± 1.76 . ($\alpha = 0.009$)	The results showed that there was a significant effect on mothers' knowledge about stunting after being given education using brainstorming and audiovisual. The value of maternal knowledge on the pre-test was 6.44 ± 1.65 , while the score on the post-test increased to 7.38 ± 1.76 . ($\alpha = 0.009$)

Table 2 (continued)

Author	Participants	Study design	Type of intervention	Instruments	Most important results
Setia et al., (2020a)	as many as 46 people with Thirty-three mothers under five and 13 pregnant women	<i>quasi-experimental</i>	The intervention is in the form of nutrition education, which is given twice a month using the Brief Strategic Family Therapy (BSTF) model, which provides counseling on balanced nutrition for families, pregnant women, and mothers with toddlers	Questionnaires about nutritional knowledge, attitude, nutrition, and behavior	Family-based nutrition education affects changes in knowledge, attitudes, and behavior of mothers with low economies and pregnant women with a value of $p = 0000 < \alpha 0.05$, respectively
Rita and Lewar, (2020)	Thirty mothers were in the treatment group, and 30 were in the control group	<i>Quasi-experiment with non-equivalent control group design</i>	The research intervention was in the form of a nutrition education program on the benefits of consuming Moringa oleifera, or so-called Moringa leaves can prevent stunting in children	<i>Questionnaires mother's knowledge about stunting prevention using Moringa oleifera</i> ; measure mother's knowledge	Nutrition education on the benefits of consuming Moringa oleifera or so-called Moringa leaves significantly increased maternal knowledge ($p = 0000$)
Yunitasari and Nadhifah et al., (2020a)	control group 20 premarital couples and a treatment group 20 premarital couples	<i>Quasi-experimental design</i>	Health education interventions on stunting prevention using modules and group discussions or <i>peer group discussions</i> have given pre-test and post-test	<i>Questionnaires</i> : Questionnaires on stunting prevention, Questionnaires in the form of nutrition before pregnancy, questionnaires during pregnancy and breastfeeding, as well as exclusive breastfeeding and complementary foods	There is a health education effect using modules and group discussions or peer group discussions on mothers' knowledge ($p = 0000$)

Table 3 Effects of nutrition education programs on children

Author	Participants	Study design	Type of intervention	Instruments	Most important results
Demilew et al., (2020)	346 women in the group intervention and 348 women in the control group),	Randomized controlled trial	Intervention in the form of standard health and nutrition services plus nutrition education interventions (intervention group), while the control group received nutrition education provided by health workers during home visits or community activities	<i>Food frequency questionnaire (FFQ)</i> : measure the diet data of pregnant women <i>Balanced digital Seca scales</i> : measure birth weight	The results showed an effect on birth weight in infants with an increased intervention-average value of 0.257 kg /0.26 kg compared with birth weight in the control group ($\beta = 0.257, p < 0.001$)
Effendy et al., (2020)	266 mother-child pairs from 22 Posyandu working areas were eligible and registered with this research	Randomized controlled trial	Intervention 'Movement for Smart Mothers, Children, Healthy, Well Nutrition' (GEN) The class was held in June 2018. The delivery of material used lectures, media, pictures, and videos	<i>Dietary diversity scores (DDS)</i> : measure the diversity of a child's diet <i>Minimum meal frequency (MMF)</i> : measure the frequency of eating and drinking <i>Minimum acceptable diet (MAD)</i> : measure an acceptable diet <i>Anthropometric parameters</i> : measure air quality <i>Electronic weighing scale</i> : measure the child's weight <i>Horizontal board</i> : length of the child's body measured from head to toe	The results showed that influence intervention at a high z-score for age 0.24 (-0.06 to 0.56) <i>p</i> . Value = 0.112 Score-weight-for-age 0.04 (-0.26 to 0.35) <i>p</i> . 0.747 Length (cm) 0.59 (-0.15 to 1.34) <i>p</i> . Value = 0.112 Weight (kg) = 0.03 (-0.28 to 0.35) <i>p</i> . Value = 0.825 However, the prevalence of stunting remained stable in the intervention group but increased in the control group
Khan et al., (2020)	Eight hundred seventy pregnant and lactating mothers (419 in intervention; 451 in control) children aged 6–18 months were enrolled in the study	Randomized controlled trial	The intervention was given to children aged 6–23 months in the form of 50 mg wawanam in the form of lipid-based nutritional supplements (consisting of roasted green beans, vegetable oil, dry skim milk powder, sugar, micronutrients, emulsifiers, and antioxidants). Meanwhile, the control group received routine public and private health services available in the area	<i>Seca anthropometry kits</i> : measure the length and weight of the child (linear monitor growth)	The results confirmed that giving wawanam to children aged 6–23 months effectively reduced the risk of stunting, wasting, and anemia

Table 3 (continued)

Author	Participants	Study design	Type of intervention	Instruments	Most important results
Nurhayati et al., (2020)	Twenty-two mothers with children of respondents, and the sample was taken as many as 22 respondents by total sampling	<i>Cohort experiment approaches</i>	The intervention takes the form of health counseling about short nutrition, which will be held from 10 May to 10 June 2020	<i>Weight scale</i> : measure the weight of a stunting toddler	Based on the study results, health education's effect on maternal malnutrition on the weight of children under five who were monitored for one month in Gampeng Village, Ngluyu District, Nganjuk Regency, where the value of $p = 0000 \leq \alpha 005$ was acceptable
Mahmudiono et al., (2018)	Seventy-one mother-child pairs to 35 in the intervention group and 36 in the control group	<i>Randomized controlled trial</i>	NEO-NOM Intervention (Usual Care + Nutrition Education + Home Visit) is in the form of regular care, nutrition education, and a home visit for 12 weeks. Meanwhile, the PRINT (Usual Care + Printed Material) group only received regular maintenance and printed materials	Diet data were analyzed using Nutrisurvey software that refers to a database containing nutritional information	Results There was a significant effect of both groups on the child's height and weight, but no significant differences were observed between groups. Maternal independence, expected outcomes in providing animal protein to children (p -value = 0.025), and maternal total calorie intake (p -value = 0.017) were preferred in the intervention group over the comparison group

can occur because health education information using the CBD method can be received and responded to well. This study's results are from research conducted by (Yunitasari & Rahayu et al., 2020b) that the LBD method can affect the mother's level of knowledge. Increased ability is closely related to knowledge about health care, feeding, hygiene, and awareness of their children's health. Maternal education tends to be higher for children with good nutrition and vice versa. Several studies have shown that the mother's last education is one factor causing malnutrition in infants and toddlers (Athavale et al., 2020; L.M. et al., 2018; Muluye et al., 2020; Owais et al., 2019; Wahyurin et al., 2019).

Existing nutrition education studies to prevent malnutrition intervened by engaging and training community workers and advising caregivers on children's diets (Sharma et al., 2020). Nutrition education can increase knowledge and practice of complementary feeding for mothers with children aged 6 to 23 months (Barone et al., 2021; Muluye et al., 2020; Walters et al., 2019). Meanwhile, several studies have stated that giving food supplements to mothers during pregnancy and to children aged 6–24 months can increase the child's weight. For example, providing wheat soya blend plus to pregnant women and lipid-based nutrient supplements to children aged 6–23 months can increase the child's weight. Children who received intervention during the first 1000 days had a 0.3 SD increase in length for age Z scores at 24 months of age (Soofi et al., 2022). A study in Cambodia found that children aged 6–23 months who received a lipid-based nutrient supplement (LNS) would gain weight. The mean height-for-age z-score in the population receiving LNS was higher than that in the control group (-1.14 vs. -1.60 , $p < 0.001$) (Molto et al., 2022).

Demonstrations can make learning more explicit and concrete and stimulate respondents to be more active in observing and trying it for themselves (Yunitasari & Rahayu et al., 2020b). The demonstration method's application triggers the respondents to deepen their knowledge by reactivating their experience so that the knowledge gained during the demonstration can be controlled adequately. The knowledge provided by the demonstration method is well stored in the brain and hard to forget (Wahyurin et al., 2019).

Combining the lecture method with brainstorming and demonstrations can generate creative thoughts and stimulate respondents to seek problem solutions, seek new opinions, and create a pleasant atmosphere in the group. (Wahyurin et al., 2019). In addition, discussion sessions in brainstorming can encourage communication between members, positive dependence, individual responsibility, and group process evaluation (Fahrhani et al., 2020). At the same time, the demonstration is an effective method for visualizing the material provided. Furthermore, this method will stimulate vision and hearing, which can develop imagination and critical thinking so that attracting attention, concentration, and understanding of the material will also increase (Fahrhani et al., 2020).

Nutrition education with *Brief Strategic Family Therapy* (BSTF) is applied to families to prevent stunting in toddlers by assessing knowledge, attitudes, and actions. Family-based nutrition education affects mothers' knowledge, attitudes, and behavior in preventing stunting in toddlers and pregnant women (Davison et al., 2019; Jones et al., 2019; Setiaa et al., 2020a, 2020b). The family-based nutrition education

can influence mothers' behavior regarding balanced nutrition to prevent stunting (Dinengsih & Hakim, 2020). Nutrition education affects maternal behavior by providing a balanced menu, increasing knowledge and attitudes, and providing a balanced menu for toddlers (Demilew et al., 2020; Setia Shagti Boro et al., 2020a),

Nutrition education with media in booklets and direct samples (food samples) will make it easier for research subjects to understand because it attracts attention and is not dull. The two groups show this by increasing the value of knowledge, attitudes, and behavior of pregnant women and mothers with toddlers. According to sensory experts, 75% to 87% of human experience is transmitted through the sense of sight. The pictures in the booklet on how to wash hands properly and examples of dishes are stimuli that may be easy for the sample to remember so that the value of knowledge, attitudes, and eating behavior increases (Suryati & Supriyadi, 2019).

Nutrition counseling aims to help the community change behavior related to nutrition or health to improve the quality of the client's health, including changes in knowledge, attitudes, and actions (Demilew et al., 2020; Masthalina & Agustina, 2018). The counselor provides positive information and direction that can transform negative information. The counselor also directs clients to be able to determine attitudes and decisions to overcome nutritional problems experienced (Demilew et al., 2020; Worku et al., 2020). The counselor aims to help clients change behavior related to health or nutrition to improve food and health (Abiyu & Belachew, 2020).

E-Health education using module media and group discussions influences women's premarital knowledge, changes in the treatment group before health education is carried out using module media, and group discussions in the control group. The discussion method can have a functional influence that can positively affect the mother's knowledge. Exposure to information from a person will affect the level of expertise. The sources of information obtained affect a person's knowledge, such as print media, electronic media, and health workers. A person with many sources of information will provide more precise knowledge about stunting prevention (Yunitasari Nadhifah et al., 2020a).

Educational interventions using flipcharts with additional material from mother-child health (MCH) books and audiovisual media from mobile applications are also quite valuable for increasing knowledge and self-confidence among mothers with low birth weight. Studies on the benefits of having and using MCH Handbooks have been carried out many times, some of which are studies on the utilization of health services for infants and children, leading to changes in mothers' level of knowledge and self-confidence (Kavle et al., 2019; Nankumbi et al., 2019). Furthermore, it can increase the mother's capacity to provide care at home. A lesson on using the MCH handbook for neonatal care users covers several topics, such as early initiation of breastfeeding, preparation for breastfeeding, exclusive breastfeeding, the introduction of complementary foods from breast milk, intake of vitamin A, and rates of morbidity and mortality of newborns (Zolekhah et al., 2020). MCH books also impact immunization visits, providing proper nutrition, children consuming various foods, training children to eat alone, and monitoring children's growth and development (Zuraida et al., 2017).

The use of smartphone technology in mobile applications is considered an efficient way to provide health information in various healthcare clinics (Sugiarti et al., 2020).

Using a mobile-based application can significantly improve mothers' knowledge about their children's health by comparing the questionnaire data filled out after using the mobile application and the experience of mothers who were assessed before they downloaded the application (Goudet et al., 2019; Huckvale et al., 2020; Patel et al., 2019).

Similarly, the study aims to develop mobile applications and test their effect on primiparous mothers' knowledge and self-confidence. This study showed statistically increased expertise and self-confidence related to infant and postpartum care after using mobile applications (Sugiarti et al., 2020). With the rapid growth of internet technology today, it is necessary for prenatal education and professional nursing careers in prenatal health to guide and facilitate mothers to find solutions and learn from online resources to reduce errors, redundancies, and unnecessary information (Huckvale et al., 2020). This finding is also supported by an ethnographic study conducted by Sugiarti et al., (2020) on the role of technology in helping new mothers (the early period after birth) (Adam et al., 2019). There is a clear need to increase maternal self-confidence and make them more than just mothers (Haluza & Böhm, 2020).

Effects of nutrition education programs on stunting children

The results of the study found that the effects of nutrition education programs on children were: promoting optimal child growth or development, better health, and reducing stunting (Effendy et al., 2020; Khan et al., 2020; Muluye et al., 2020) increase appetite, gain weight and nutritional status of children Demilew et al., (2020); Nurhayati et al., (2020), has an effect on intelligence, productivity, and creativity of children so that it affects growth and development towards adulthood.

Nutrition education for pregnant women in increasing knowledge and practice of healthy diets will ultimately determine the nutritional status of babies (Diddana et al., 2018). Mothers' nutritional knowledge is an essential factor in their ability to choose nutritious foods to feed their children as well as manage the available resources to provide food. It has been demonstrated that empowering mothers through nutrition education effectively addresses poor feeding practices in children (Effendy et al., 2020). The benefits of increasing knowledge for parents of children with stunting, LBW, or premature babies require a higher standard of care. Health education given to mothers with stunted children can increase self-confidence, helping mothers deal with the stress of caring for their babies and ultimately improving their children's nutritional status (Permatasari et al., 2021).

Conclusion

Nutrition education programs for mothers are essential in improving children's nutritional status. Nutrition education will increase mothers' knowledge in choosing appropriate and safe food ingredients and how to give good food so that it can prevent nutritional disorders in children. The results of this study can be recommended for the government to develop various health promotion strategies and interventions for children with nutritional disorders. Research that can be further developed is to conduct trials of various nutrition education interventions for mothers and feeding interventions to improve children's nutritional status.

Acknowledgements

We would like to acknowledge the Health Sciences Faculty, Muhamamadiyah University of Malang, for the assistance in undertaking this research.

Author contributions

YBP, PP, HDS contributed to the literature review, research design, analysis, and writing of the manuscript. The authors read and approved the final submitted paper.

Funding

No funding was available for this study.

Availability of data and materials

The datasets supporting the conclusions of this article are included within the article.

Declarations**Ethics approval and consent to participate**

Not Applicable because of review research.

Consent for publication

Not Applicable.

Competing interests

The authors declare that they have no conflict of interest.

Received: 28 March 2021 Accepted: 27 March 2023

Published online: 08 April 2023

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