Exploring the Antenatal Nutrition Education Model in Indonesia

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Abstract. An effective nutrition education model potentially improves women's dietary habits during pregnancy, leading to positive health outcomes for both mothers and their offspring. This review aimed to explore existing nutrition education models delivered to pregnant women in Indonesia and improvements needed in the future. This review investigated scientific literature published between 2013 and 2023. Three themes were found from this review: 1) Nutrition education can be delivered in various ways, where pregnant women require different nutritional education approaches according to their socioeconomic background; 2) Healthcare professionals had a number of obstacles in providing nutrition education for pregnant women; 3) Most research reported nutrition education increased knowledge and awareness of pregnant women in nutrition, but rarely research reported changes in eating behaviour. This review has identified several key recommendations to enhance the nutrition education model for pregnant women. These recommendations encompass: 1) Establishment of regulatory guidelines and support from health authorities to bolster antenatal nutrition education; 2) Integration of nutrition education within routine antenatal care (ANC) sessions; 3) Customized nutrition education programs tailored to the socioeconomic backgrounds of women; 4) Implementation of strategies to enhance skills conducive to promoting dietary behaviour changes; 5) Further research focusing on nutrition education models, particularly on women's dietary behavior modifications; and 6) Strengthening peer and community support systems that facilitate nutritional behavioral changes during pregnancy.

Keywords: Antenatal Nutrition Education Model, Pregnancy, Indonesia.

1 Introduction

Nutritional status during pregnancy is crucial for the health of women and their offspring in the short and long term [1]. To obtain optimal nutritional status, pregnant women need to consume balanced nutritious food in proportional amounts according to their nutritional needs [2]. Therefore, to ensure all pregnant women are able to consume the necessary nutrients, they need increased knowledge, attitudes, and nutritional behaviour [3, 4].

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An optimum diet for pregnant women, which meets the needs of essential nutrients, can support fetal growth and development, including optimal brain and cognitive development, as well as the maturation of important fetal organs [2]. Excellent nutritional intake will support infants' optimum growth and development and reduce the risk of health problems [5, 6]. An optimum diet for pregnant women is also important to ensure mothers' health and reduce pregnancy complication such as anemia, hypertension, preeclampsia, and gestational diabetes [1, 7]. Adequate macro and micro nutritional intake can also reduce the risk of pregnancy complications, such as operative delivery, bleeding during childbirth, as well as other health risks [5, 8, 9].

Pregnant women need a timely and a proper nutritional intake, neither deficient nor excessive [8, 9]. Underweight and low gestational weight gain (GWG) may increase the risk of small for gestational age [10], prematurity (<37 weeks) and low birth weight (<2500 g) [11] and maternal mortality [12]. Maternal low stature (height < 146-157 cm) increase the risk of operational delivery [13] prematurity and low birth weight [14] and obesity as well as non-communicable diseases in the future [15]. On the other hand, consequences of obesity and excessive GWG include the risk of gestational diabetes [16], preeclampsia [17], prematurity, operative delivery [9], high birth weight (birthweight >4,000 g) [18], postpartum obesity [19] and obesity-related diseases [20].

Further, micronutrient deficiencies increase the risk of pregnancy complication and health problems. For example, vitamin A deficiency increase the risk of night blindness [12], maternal mortality, SGA, prematurity, LBW and congenital defects [21]. Folate deficiency increase the risk of neural tube defects and infant mortality [12]. Vitamin D deficiency increase the risk of gestational diabetes, preeclampsia, stillbirth, prematurity [22], rachitis, osteopenia and allergy [21]. Iron deficiency as the most common deficiency worldwide increase the risk of LBW, infant and maternal mortality [12, 23]. Calcium deficiency increase the risk of preeclampsia, prematurity, neonatal morbidity and mortality [24]. Iodine deficiency increase the risk of cretinism [12], miscarriage, permanent cognitive disturbance, infant mortality [25]. And lastly, zinc deficiency increase the risk of impaired growth, immunity and metabolism [12].

In order to fulfill the goal of pregnant women being able to consume nutritious food and meeting their needs, pregnant women and their families need adequate nutritional education [3, 4]. A comprehensive nutrition education model is to guide healthcare professionals in providing nutrition education to pregnant women and their families. Eventually, pregnant women, assisted by their families, will be able to implement a balanced nutritional pattern throughout their pregnancy [26].

This review aimed to examine good practices in nutrition education that have been carried out, and models of nutrition education that should be adopted so that pregnant women and their families receive the nutrition education they need in order to optimize the mother's diet and nutritional status as well as optimal growth and development of the fetus.

2 Methodology

This review was carried out through literature searches to assess models of nutrition education and nutrition-related antenatal services for pregnant women in Indonesia. Literature searches were carried out through the Garuda portal and Google Scholar. The inclusion criteria were as follows: 1) Studies conducted on pregnant women; 2) The studies assessed variables related to nutrition education model to pregnant women in Indonesia; 3) Either experimental, observational, or qualitative studies; 4) Studies published in English or Bahasa; 5) Studies published between 2013 and 2023. The exclusion criteria for this review were: 1) Studies did not relate to pregnancy or nutrition education for pregnant women; 2) Studies in languages other than English or Bahasa, without available English or Bahasa translations; 3) Studies with inadequate data or inaccessible full-text articles; 4) Studies published before 2013 or after 2023.
Keywords in this literature searches were 'nutrition education', 'nutrition counseling', 'antenatal nutrition care', 'antenatal nutrition education', 'nutrition education model', 'nutrition education framework', 'pregnant women', and 'Indonesia'. I used Boolean operators (OR, AND) to combine these keywords effectively. Further, the literature obtained were managed using Endnote X8 [27].

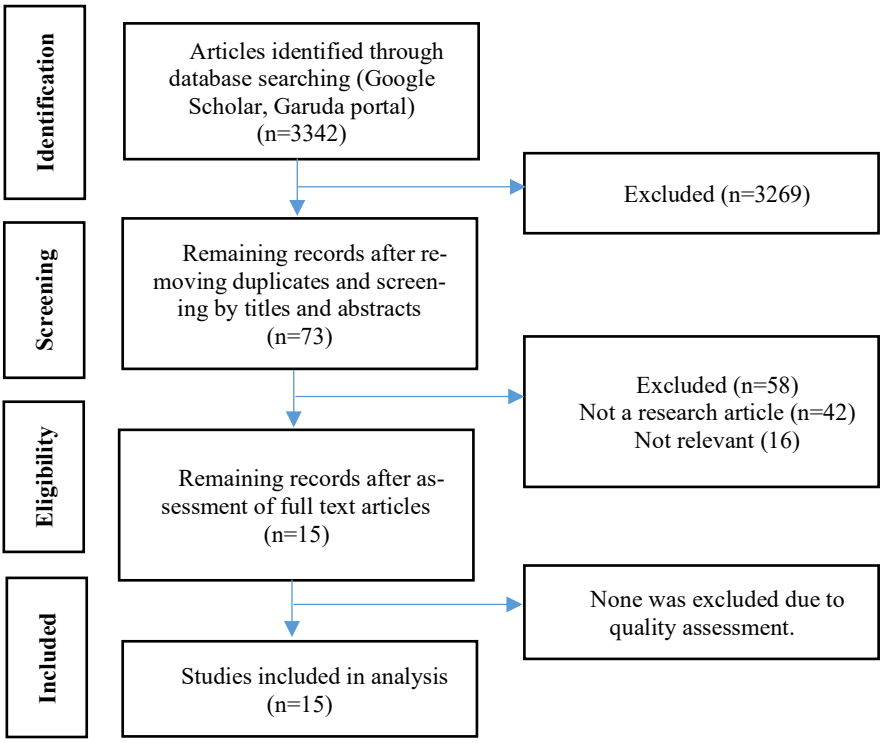

Fig. 1. Flow diagram of the searching strategy

3 Result

Based on keywords, 73 articles were obtained. After reviewing the suitability of the articles to the review objectives, finally, 15 were selected for further analysis.

Three themes were found from this review: 1) Nutrition education can be delivered in various ways, where pregnant women require different nutritional education approaches according to their socioeconomic background; 2) Healthcare professional had a number of obstacles in providing nutrition education for pregnant women; 3) Most research reported nutrition education had increased knowledge and awareness of pregnant women in nutrition, but rarely research reported changes in eating behaviour. The list of articles and summary of the findings is presented in Table 1.

Table 1. Summary of articles related to nutrition education model to pregnant women.

References	Methods	Findings
[28]	Qualitative, 23 pregnant women, Malang	Pregnant women sought and obtained nutritional information from various sources including health professionals, networks and the internet with varying levels of trust. Health professionals including doctors, midwives and nutritionists did not provide timely, consistent and adequate nutrition education.
[29]	Survey of 335 women, Malang	Pregnant women from high socio-economic strata were more likely to receive nutritional information from obstetricians, family or online sources; while women from low socio-economic strata were more likely to receive nutritional information from midwives, health volunteers, or Maternal and Child Health books.
[30]	Qualitative, healthcare professionals and pregnant women (n=27), Magelang	Healthcare professionals have several obstacles in delivering ANC and nutritional counselling, including a lack of human resources and leadership management.
[31]	Qualitative, 23 nurse-midwives, Yogyakarta	The nurse-midwives reported three main barriers in providing education related to anaemia during pregnancy: insufficient clinical skills and competence; cultural beliefs and low family participation in antenatal care programs; and lack of facilities and skilled support staff at public health centers.
[32]	Qualitative, 24 healthcare professionals, Malang	This research emphasized the importance of an education model that optimizes education through various delivery methods, starting from nutritional counselling integrated into ANC at public health centers, classes for pregnant women, health education in the community, home visits, and digital delivery.
[33]	Quasi-experiment of 22 pregnant women, Medan Tembung	Nutrition counselling increased pregnant women's knowledge about nutrition and gestational weight gain.

References	Methods	Findings
[34]	Experimental study of 18 pregnant women, Kediri	Group of nutritional education for pregnant women increased pregnant women's knowledge about pregnant women nutritional requirements.
[35]	Pre-experimental study of 35 pregnant women, Bogor Barat	Nutrition education through classes for pregnant women increased women's knowledge about pregnancy nutrition to prevent stunting.
[36]	Quasi-experiment to 30 pregnant women, Seluma	An integrated nutritional service into ANC program for the 2nd and 3rd trimester pregnant women increased healthy fetal growth.
[37]	One group pre-test & post-test study, 49 pregnant women, Banjar	Short message service (SMS) was useful as a channel for conveying health and nutritional education. Nutrition education via SMS increased pregnant women's understanding and awareness on pregnancy complications, pregnancy nutrition, routine ANC services.
[38]	True experiment, 19 pregnant women, Mojokerto	WhatsApp Group can be used as an effective channel for providing nutrition education to increase nutritional knowledge and attitudes of pregnant women, particularly when face-to-face education cannot be delivered.
[39]	Intervention to 30 pregnant women, Padang Panjang	Online-based pocketbook media increased pregnant women's knowledge, awareness and behavior regarding nutrition and gestational weight gain.
[40]	Pre-experimental design pre-post-test to 30 pregnant women, Sokaraja Lor	Nutrition education using audiovisuals increased pregnant women's knowledge about pregnancy nutrition.
[41]	Experimental study to 40 pregnant women, Bengkulu	Education using leaflets and iron anemia discs (*cakram*) increase pregnant women's knowledge, attitudes and behavior regarding nutrition to prevent anemia.
[42]	Quasi-experiment to 43 pregnant women, Tanjungpinang	Nutrition education using the Android platform increased pregnant women's knowledge on nutrition.
[43]	Cross-sectional study to 766 pregnant women, South Sumatera, West Kalimantan, Central Kalimantan	Pregnant women who received nutrition education through mass campaigns had better knowledge and attitudes regarding iron supplement tablets. However, there was no difference in women's habit of taking iron supplement tablets in both groups. Providing nutrition education with low exposure can increase knowledge and attitudes, but it may not necessarily change a person's behavior.

4 Discussion

This review found three main themes regarding nutrition educational model for pregnant women in Indonesia. Firstly, nutrition education should be delivered in various ways, where pregnant women require different nutritional education approaches according to their socioeconomic background. Pregnant women from higher socioeconomic strata had more opportunity to obtain nutritional information from various sources, such as obstetricians and the internet compared to pregnant women from lower socioeconomic strata [29]. Pregnant women from higher socioeconomic strata had more various access to health facilities such as obstetricians, the internet or health education programs so that they have a greater opportunity to obtain reliable nutritional information. On the other hand, pregnant women from low socioeconomic strata may have obstacles in accessing health services or finding nutritional information. For this reason, future educational models should be able to reduce this gap and provide nutrition education that is accessible to pregnant women from all socioeconomic backgrounds.

Secondly, healthcare professional providing ANC and nutrition education have a number of obstacles in providing nutrition education for pregnant women. Widyawati et al. [31] reported limited clinical competence and skills, lack of facilities and trained support personnel, cultural barriers, and low family participation in nutrition education session. Further, Rahmawati et al. [32] reported limited number of nutritionists compared to the number of pregnant women in the working area of public health centers, scarcity of comprehensive guidelines, lack of healthcare professionals' knowledge on up-to-date nutritional science, and limited time during nutrition education and antenatal care services. In addition, Kusyanti et al. [30] disclosed two obstacles of healthcare professional in conveying nutritional education. These include the lack of human resources and limited management leadership [30]. These obstacles require careful attention from health and nutrition authorities so that nutrition education could be better planned and developed. For example, by creating a framework for providing nutritional education, arrangement regarding providing nutrition education at every ANC meeting, regular training for healthcare professionals in providing counseling and nutrition education, as well as equipping facilities and supporting staff for the implementation of nutrition education. In addition, the existence of cultural barriers and the lack of participation of pregnant women's families in nutrition education activities can be overcome with several approaches, for example inviting families including husbands or mothers of pregnant women to pregnancy classes or nutritional counseling, as well as by providing nutrition education through community activities such as community meetings or health volunteers' home visits [29].

Thirdly, most nutrition education can increase knowledge and awareness of pregnant women in nutrition, but rarely research reported changes in eating behavior. Gamboa et al.'s study [43] found that pregnant women who received exposure to mass campaign had higher knowledge and awareness on anaemia and iron-folic acid supplementation compared to women who did not receive mass campaign exposure. However, there was similar behaviour in taking iron and folic acid supplementation in both groups. The

cause of this phenomenon is that exposure to nutritional information obtained by pregnant women is low [43]. For this reason, it is not enough to provide education and nutritional information only once or twice but must be provided with more frequent exposure. This condition could be caused by the implementation of nutritional knowledge and awareness into behavior change requiring several stages that need to be considered. For example, to be able to adopt good eating behavior, it is not enough for a pregnant woman to just knowing what type of food is important to consume for their health. They need to have several important skills to be able to access, prepare and consume healthy foods. These skills include: 1) skills in planning and allocating existing resources to obtain nutritious foods; 2) skills in selecting types of nutritious food that can be accessed and purchased according to their abilities; 3) skills in preparing and processing food ingredients appropriately in order to obtain food that is nutritious and delicious to eat; and 4) skill to consume and enjoy healthy foods to fulfill their nutritional requirements. These important skills are called food literacy [44]. Therefore, it is important that nutrition education provided by health professionals should not only increase knowledge about nutrition, but also improve important skills according to the food literacy components. Furthermore, a woman who has good knowledge and awareness about nutrition cannot implement her knowledge if it is not supported by the people around her. Therefore, nutrition education needs to pay attention to socioecological factors of decisions in nutrition. The importance of considering socioecological factors in nutrition education is because in making decisions regarding food, a pregnant woman is influenced by various factors, including women's family, friends and the environment [45].

This ree implications of this review include: First, there is a need for awareness from health authorities to create national nutrition education guidelines, allocate resources and training for ANC professionals and nutritionists so that they can provide quality nutrition education to all communities regardless of socioeconomic background. Secondly, the need for integrative nutritional education into routine ANC so that pregnant women can receive consistent and reliable nutritional education throughout their pregnancy. Thirdly, nutrition education needs to be designed in a tailored nutritional education manner, so that it takes into account the needs and access of pregnant women from various socio-economic backgrounds. Fourthly, nutrition education needs to be designed not only to provide nutritional information, but to improve the skills of pregnant women to make healthier dietary changes. Fifth, future research needs to examine behavioural change models to better understand the impact of nutritional education on actual dietary practices. Lastly, peer and community support are important to ensure there is reinforcement of nutritional education so that exposure to nutritional information can increase, as well as providing a supportive environment that supports pregnant women to adopt improved dietary changes.

This review highlighted several significant implications. First, health authorities should prioritize the development of national nutrition education guidelines, allocate resources, and provide training for ANC professionals and nutritionists to ensure equitable access to high-quality nutrition education, regardless of socioeconomic back-

ground. Second, incorporating nutrition education into routine ANC sessions is essential for consistently delivering reliable nutritional guidance to pregnant women throughout their pregnancies. Third, tailoring nutrition education to the specific needs and accessibility of pregnant women from diverse socioeconomic backgrounds is crucial. Fourth, beyond imparting nutritional information, nutrition education should focus on enhancing the skills of pregnant women, enabling them to make healthier dietary choices. Fifth, future research should investigate behavioral change models to gain deeper insights into the impact of nutritional education on actual dietary practices. Sixth, cultivating peer and community support is vital for reinforcing nutritional education, increasing exposure to nutritional information, and creating a supportive environment that encourages pregnant women to adopt healthier dietary habits.

5 Conclusion

This review found three important findings including the need to provide nutrition education through various means, obstacles for healthcare professionals in providing nutrition education, and most nutrition education can increase knowledge and awareness of pregnant women but does not necessarily have an impact on improving diet.

This review proposed a number of implications such as the need for regulations, guidance and support from health authorities, the need for integration of nutrition education into routine ANC sessions, the need for tailored nutrition education that takes into account women's background, the need for efforts to increase skills that support behavior change, the need for Further research uses a behavioral change model that examines behavior changes, as well as the need for peer and community support that can support changes in nutritional behaviour.

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