

RELEVANT TOPICS FOR EDUCATION MODULES ON HEALTHY EATING DURING PREGNANCY IN THE CONTEXT OF INDONESIA

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ABSTRACT

Objective: Nutrition in pregnant women influences fetal and maternal health. Nutrition education is used to improve the nutritional status of pregnant women, but currently, there are no guidelines available for this demographic in Indonesia. Therefore, this qualitative study aims to identify topics relevant to healthy eating in pregnant women in Jakarta, Indonesia.

Methods: The mixed-methods approach included an online survey to understand the problems (relevant to healthy eating) that pregnant women face and the subjects that they lack information about and a review of the relevant literature. The information obtained from both sources was analyzed by a panel of experts with the multi-step Delphi technique, and a list of relevant topics was created.

Results: The study was conducted from April to September 2019 and included 37 pregnant women and 10 experts in nutrition and obstetrics–gynecology. The 13 relevant topics identified were: (1) importance of healthy eating during pregnancy; (2) food groups and serving sizes; (3) nutrition requirements during pregnancy and use of multivitamins/supplements; (4) foods to be restricted or avoided; (5) substances to be restricted or avoided; (6) weight gain during pregnancy; (7) physical activity requirements; (8) tips for ensuring the safety of food; (9) menu containing healthy foods for pregnant women; (10) pregnancy problems related to eating patterns and solutions; (11) healthy eating tips for women with special conditions; (12) myths and facts about eating patterns during pregnancy; and (13) healthy eating for lactation.

Conclusion: These topics would be useful for the creation of nutritional education material for pregnant women in Indonesia.

Keywords: Healthy eating, Module development, Pregnancy, Qualitative study

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INTRODUCTION

The first 1000 d of life—from conception up to the second birthday of a child—have the most profound effect on fetal development and maternal health [1]. Therefore, nutrition in pregnant women has an important influence on the growth and development of a healthy foetus [2]. During fetal development, pregnant women experience changes in metabolism, hormones, and psychology. Both the quality and quantity of food influence maternal health during pregnancy, normal birth, faster recovery after delivery, and normal development and appropriate weight gain in the foetus [3, 4], and it is therefore necessary to pay attention to the increased nutritional needs of mothers during pregnancy and breastfeeding [5]. In a review by Lee, the proportions of dietary components recommended in Asia and Africa were: protein, 10–15%; fat, 15–30%; and carbohydrates, 55–75% [6]. In 8 of the 25 studies reviewed, the percentage of fat intake was below 20%, which is the lowest limit recommended by the FAO/WHO for women of childbearing age [6]. This finding points to the need for adequate nutrition for mother during pregnancy.

Good nutrition and healthy eating patterns play an important role in the health of the mother and baby during pregnancy [7]. A study conducted by McGowan found that up to 45% of pregnant women may not report their daily energy intake [8]. Educational attainment was found to be an important predictor because women who reported their energy intake were identified as being less likely to comply with the current dietary recommendations for pregnancy [8]. The data reported by the study highlight the need for public health education interventions among pregnant women that can provide guidance about the current dietary standards [8]. Providing education about nutrition is one of the strategies used to improve the nutritional status of pregnant women. This strategy focuses on improving the quality of maternal nutrition by providing information on increasing the diversity of food and amounts of certain foods consumed, maintaining an appropriate and balanced body weight, and consuming optimal amounts of micronutrients sustainably [7]. Another study observed that this strategy had a positive impact on prenatal mothers; in

particular, counseling interventions on nutritional knowledge and quality of diet had a positive impact on pregnant adolescents [9]. Another study recommended the use of education modules that are packaged in a systematic and interesting way and facilitate independent learning [10].

Some countries have already developed dietary guidelines and recommendations specifically for the optimization of maternal and fetal health during pregnancy [2], for example, the Healthy Eating during Pregnancy and Breastfeeding Booklet for Mothers from WHO Europe (2001), the Pregnancy Book from the Department of Health UK (2010), and Food Safety during Pregnancy from the Department of Primary Industries Australia (2011). In Indonesia, there are general nutrition and health guidelines, such as Pedoman Gizi Seimbang (Balanced Nutrition Guide) (2014), Pegangan Fasilitator Kelas Ibu Hamil (Pregnant Class Guide for Facilitator), Paket Makan Bayi dan Anak-anak (Infant and Child Food Packages) (2015), and Panduan Hidup Sehat Edisi Keempat (Guide to Healthy Living: Fourth Edition) (2010), issued by the Ministry of Health. However, these guidelines only provide general guidelines for a healthy lifestyle and do not focus specifically on healthy eating in pregnant women. Further, guidelines from other countries on healthy eating patterns during pregnancy need to be modified according to the conditions of pregnant women in Indonesia. Adherence to dietary guidelines has been used as an indicator of diet quality [11]. However, this is difficult in the absence of scientific information about healthy eating patterns presented in a systematic format for pregnant women in Indonesia. Therefore, as a step towards the creation of such educational material, the present qualitative study aims to identify relevant topics about healthy eating patterns for pregnant women in Indonesia.

MATERIALS AND METHODS

The present study uses a mixed-methods design, including qualitative and quantitative approaches and Kemp's model [12, 13], to identify topics for health education modules that are presented in a multi-step instructional design. This study was conducted from

April to September 2019 in Jakarta, Indonesia, and included Central Jakarta, East Jakarta, South Jakarta, and North Jakarta. On account of limited resources, West Jakarta and *Kepulauan Seribu* could not be included [14]. Below, the steps for the creation of model are described.

Identifying problems with health and nutrition and topics that pregnant women need more information about

A short survey was conducted to collect the opinions of pregnant women regarding the health and nutrition issues they face, as well as the topics related to healthy eating during pregnancy that they needed information about. The consecutive sampling method was used, and a questionnaire containing open-ended questions was distributed via an online Google form. Before the questionnaire was sent out, the background, aim, and procedure of the study were explained to the pregnant women who participated in the survey. The criteria for inclusion were: (1) Absence of complications, (2) age of 20–40 y, (3) provision of informed consent to participate in the study (after having received information about the research), (4) ability to use media for communication and electronic applications, and (5) no difficulty in oral and written communication. The research samples were collected consecutively until the required number of samples was obtained.

Identifying relevant topics on healthy eating during pregnancy via a literature review

Topics that are relevant to the research were explored through literature review and intensive communication between researchers and advisors. Additionally, the literature on the topic of healthy eating among pregnant women was collected. The following keywords were used in the literature search: 'healthy eating for pregnant women', 'eating patterns during pregnancy', 'nutrition for pregnant women', and 'nutrition education during pregnancy'. Articles that contained (1) guidelines that focus on healthy eating during pregnancy and (2) guidelines issued in English and/or Indonesian were included in further analysis. The guidelines published in the included papers were used to as supplementary data to the respondents' data obtained in the survey.

Criteria for the selection of resource persons

The purpose of this stage was to recruit resource persons, who are defined as experts who assess topics. Knowledge from individuals with special expertise was needed to understand in-depth healthy eating patterns during pregnancy. This study involved several experts who were selected based on the interview criteria and participation was voluntary, and the experts used the Delphi technique was analysis. The inclusion criteria for these experts were: (a) Lecturer in nutrition from a formal educational background, with the last held position being that of magister or doctorate; (b) Lecturer in obstetrics-gynecology from a formal educational background, with the last held position being that of a magister or doctorate; (c) Health worker (nutritionist/dietitian or nutrition doctor) with experience working directly with the community (i.e. clinical setting or community setting); (d) Health worker (midwife or obstetrician) with experience working directly with the community (i.e. clinical setting or community setting).

Analysis and identification of topics relevant to healthy eating during pregnancy

After resource persons who met the qualifications were identified, they were asked for their assessments and opinions on topics related to healthy eating during pregnancy. In this stage, the resource persons were given a questionnaire to provide an assessment of the topics proposed. The same questions were posed to all resource persons because this stage aimed to summarize all their opinions and form a consensus on these topics. The researcher then compiled an assessment and received the feedback from each resource person. The consensus was then synthesized by the researcher based on the answers from the sources. Opinions that had the same theme and meaning were concluded as a consensus. Unclear answers were submitted back to the resource person until a homogeneous assessment was obtained. Topics that did not reach a score of 8–9 on the Likert scale (from 0 to 9 of scale) for 80% of the

total votes were excluded. If they reached the benchmark, they were included as topics relevant to the theme of healthy eating during pregnancy. The aim was to obtain these topics and arrange them in order of relevance.

RESULTS

Characteristics of the study participants

This study was conducted on a total of 37 pregnant women with a median of age 29 y (range, 20–40 y) living in Jakarta, Indonesia, including Central Jakarta (13.5%), East Jakarta (37.8%), South Jakarta (29.7%), and North Jakarta (18.9%). The women were asked to fill out a short survey in the form of an online Google form. The majority of the women were in their third trimester of pregnancy (48.6%); second-trimester and first-trimester women formed 40.5% and 10.8% of the population, respectively.

With regard to the resource persons, a total of 10 experts (aged 26–65 y) were recruited. Of the 10 experts, 4 had specializations in their latest education degree, 3 had master's degrees, 2 had bachelor's degrees, and 1 had a diploma. The experts involved in this research work as a lecturer, nutritionist, midwife, and obstetrician. Each field of work was represented by two experts who had 3–29 y of experience.

Findings of the survey conducted on pregnant women

The short survey conducted on the recruited pregnant women contained questions on: (1) the most common problems faced by pregnant women in relation to nutrition and health during pregnancy, and (2) information related to nutrition and healthy food that pregnant women were interested in learning about. The most common health problems experienced by pregnant women were neuromuscular disorders (28.95%); they reported swollen feet, tingling hands and fingers, pain (in the waist, back, and tailbone), dizziness, cramps, aches, stretch marks, and tiredness and weakness. The pregnant women also often experienced digestive disorders (26.32%), as they reported nausea and vomiting, rough bowel movement, hemorrhoids, stomach acid/ulcer, sore throat, frequent urination, diarrhea, bloating, stomach cramps, and bleeding gums. Difficulty in consuming or avoiding certain foods (18.42%); difficulty in accessing food (7.89%); lack of certain nutrients (5.26%); and decreased appetite, respiratory illnesses, low blood pressure, anemia, and spots (13.15%) were also reported. With regard to the topics that they wanted to learn about, the responses were coded under the following 13 categories: (1) Foods that can be consumed during pregnancy (including food, drinks, snacks, nutritional requirements, and supplements); (2) Foods that should be avoided/restricted during pregnancy (including food, drinks, substances, and medicines); (3) Increase in body weight during pregnancy; (4) Recommended physical, and sports activities; (5) Tips for traveling during pregnancy; (6) Problems that are often experienced by pregnant women and their solutions; (7) The importance of hemoglobin during pregnancy; (8) Myths and facts related to pregnancy; (9) Sample menus during pregnancy; (10) Nutritional requirements of the fetus (including nutritional requirements, total intake, type of nutrition, type of food, and benefits); (11) Fetal development; (12) Tips before delivery; and (13) Recommended nutrition and food during breastfeeding.

Findings of the literature review

In the studies that were selected based on the review criteria, five guidelines were found to be relevant:

- Healthy Eating during Pregnancy and Breastfeeding Booklet for Mothers from WHO Europe (2001)
- The Pregnancy Book from the Department of Health UK (2010)
- Food Safety During Pregnancy from the Department of Primary Industries Australia (2011)
- Pedoman Gizi Seimbang* (Balanced Nutrition Guide) from the Ministry of Health (2014) including the Nutrition Adequacy Rate (AKG) (2013)
- Pegangan Fasilitator Kelas Ibu Hamil* (Pregnant Class Guide for Facilitator) from the Ministry of Health (2014).

Further, topics that are relevant to the theme of healthy eating during pregnancy were identified: (1) Definition of healthy eating; (2) Food groups and serving sizes; (3) Recommendations for nutrition, multivitamin, and supplements; (4) Foods that should be

avoided; (5) Substances that should be avoided; (6) Weight gain during pregnancy; (7) Recommendations for physical activity and exercise; and (8) Tips on selection, preparation, storage, and processing of food so that it is safe for consumption.

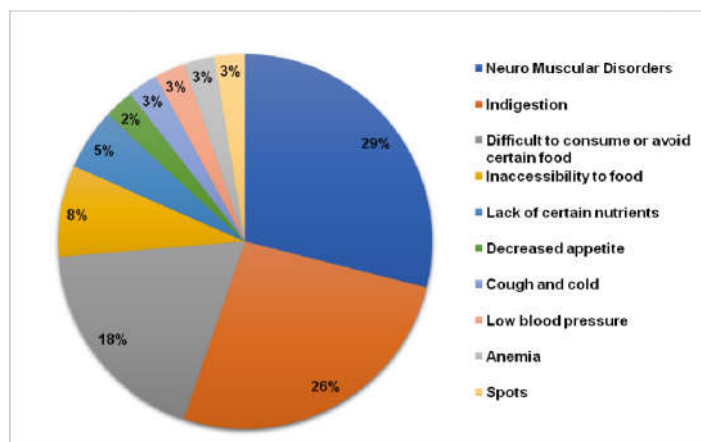


Fig. 1: Health problems experienced by pregnant women

Table 1: The comparison of findings with relevant topics from other studies about topics on healthy eating during pregnancy

Findings	Relevant topics [15]
The importance of understanding healthy eating during pregnancy	Healthy mom means a healthy baby Misunderstanding about what defines "healthy."
Nutritional and health problems that are often experienced by pregnant women	Physical symptoms like heartburn and nausea Inhibition of unhealthy food intake
The need for the amount and type of food that should be consumed by pregnant women	Food supply fluctuates each month
The need for weight gain during pregnancy	
Pregnant women's eating frequency	Mothers don't want to deprive their babies

Table 2: Information about nutrition and healthy food that pregnant women want to access

Topics	Findings
Foods that can be consumed during pregnancy	<ul style="list-style-type: none"> • Foods that can be consumed by pregnant women • Drinks that can be consumed by pregnant women • Snacks that can be consumed by pregnant women • Recommendations for nutrient requirements of pregnant women • Recommendations for supplements that can be taken by pregnant women
Foods that should be avoided or restricted during pregnancy	<ul style="list-style-type: none"> • Recommendations for foods that are to be avoided or restricted • Recommendations for drinks that are to be avoided or restricted • Recommendations for substances that are to be avoided or restricted • Drugs to be taken with caution during pregnancy
Weight gain during pregnancy	<ul style="list-style-type: none"> • Weight gain during pregnancy • Weight gain in mothers and babies
Recommendations for physical activity and exercise	<ul style="list-style-type: none"> • Recommendations for exercise • Activities to avoid during pregnancy • Recommendations for physical activity
Tips for traveling during pregnancy	<ul style="list-style-type: none"> • Tips for traveling during pregnancy
Problems that are often experienced by pregnant women and their solutions	<ul style="list-style-type: none"> • How to deal with digestive disorders • How to meet the additional nutrition requirements
The importance of hemoglobin during pregnancy	<ul style="list-style-type: none"> • The importance of hemoglobin during pregnancy • Nutrition recommendations for food consumed during pregnancy
Myths and facts related to pregnancy	<ul style="list-style-type: none"> • Myths and facts related to food consumption during pregnancy • Myths and facts related to non-food topics during pregnancy
Sample menus during pregnancy	<ul style="list-style-type: none"> • Menu for one month • Daily menu during pregnancy • Recommendations for menu and quantities • Healthy menu during pregnancy
Nutrition requirement of the fetus	<ul style="list-style-type: none"> • Nutrition requirement of the fetus • Food intake of the fetus • Nutrition absorption by the fetus • Type of nutrients and foods that are easily absorbed by the fetus and their benefits
Fetal development	<ul style="list-style-type: none"> • Information about fetal development
Tips before delivery	<ul style="list-style-type: none"> • Preparation for childbirth • How to practice breathing when training for childbirth
Recommendations for nutrition and food during lactation	<ul style="list-style-type: none"> • Nutrition requirements for lactation • Recommendations for foods/drinks that aid in the production of breast milk

Assessment of topics with the Delphi technique

The findings from the survey of pregnant women and from the literature review were assessed by the team of experts (resource persons), who then determined which topics were relevant to the theme of healthy eating during pregnancy. A total of 13 topics emerged from their analysis: (1) The importance of healthy eating during pregnancy; (2) Food groups and serving sizes; (3) Nutrition requirements for pregnant women and the use of multivitamins and supplements; (4) Foods that should be avoided/restricted during pregnancy; (5) Substances that should be avoided/restricted during pregnancy; (6) Weight gain during

pregnancy; (7) Recommendations for physical activity and exercise; (8) Tips on selection, preparation, storage, and processing of food so that it is safe for consumption; (9) Menu listing healthy food that can be consumed during pregnancy; (10) Problems in eating patterns that are often experienced by pregnant women and their solutions; (11) Tips on healthy eating for pregnant women with special conditions; (12) Myths and facts related to eating patterns during pregnancy; and (13) Recommendations for healthy eating in preparation for lactation. These topics were selected by the experts via the two-stage Delphi technique, according to which only topics with a score of 8–9 on the Likert scale (from 0 to 9 of scale) were selected.

Table 3: Mapping the content of the literature review on healthy eating during pregnancy

No	Topics	Source 1 ^a	Source 2 ^b	Source 3 ^c	Source 4 ^d	Source 5 ^e
1	Definition of healthy eating	V	-	-	V	-
2	Food groups and serving sizes	V	V	V	V	-
3	Recommendations for nutrition, multivitamins, and supplements	V	V	V	V	V
4	Foods that should be avoided	-	V	-	V	-
5	Substances that should be avoided	V	V	V	-	-
6	Weight gain during pregnancy	V	V	-	-	V
7	Recommendations for physical activity and exercise	-	V	-	-	V
8	Tips on selection, preparation, storage, and processing of food so that it is safe for consumption	V	V	V	-	-

^aHealthy Eating During Pregnancy and Breastfeeding for Mothers from WHO Europe, 2014, ^bThe Pregnancy Book from the Department of Health United Kingdom, 2010, ^cFood Safety During Pregnancy from the Department of Primary Industries Australia, 2011, ^dPedoman Gizi Seimbang from the Ministry of Health, 2014, ^ePegangan Fasilitator Kelas Ibu Hamil from the Ministry of Health, 2014

Table 4: Relevant topics identified in relation to healthy eating during pregnancy

No	Topic	Suggestion	Median (min–max)
1	The importance of healthy eating for pregnant women	<ul style="list-style-type: none"> Be creative in identifying nutritious and local food ingredients The opening/introductory section should explain why pregnant women need to eat healthy food 	9.0 (8.0–9.0)
2	Food groups and serving sizes	<ul style="list-style-type: none"> Use the word 'gizi' instead of 'nutrisi' The recommended eating frequency should be provided and explained 	8.5 (6.0–9.0)
3	Nutrition requirement of pregnant women and use of multivitamins and supplements	<ul style="list-style-type: none"> The macronutrient and fibre intake should be clarified Information must be provided about supplements that can be consumed, such as supplements that are provided by government programs 	9.0 (7.0–9.0)
4	Foods that should be restricted or avoided	<ul style="list-style-type: none"> Include evidence and reasons when presenting these foods 	9.0 (7.0–9.0)
5	Hazardous substances that should be restricted or avoided	<ul style="list-style-type: none"> As the focus is on discussing healthy eating during pregnancy, this information is not necessary 	9.0 (0.0–9.0)
6	Weight gain during pregnancy	<ul style="list-style-type: none"> Modify the information according to the context of Indonesia The optimal pre-pregnancy BMI values according to the trimester of pregnancy must be provided, and in-depth explanations of the same must be provided 	8.5 (5.0–9.0)
7	Recommendations for physical activity and exercise	<ul style="list-style-type: none"> Include information about the daily activities of pregnant women, that include more than just exercise 	9.0 (8.0–9.0)
8	Tips on selection, preparation, storage, and processing of food so that it is safe for consumption	<ul style="list-style-type: none"> Provide information about cooking utensils and food ingredients that are safe to use 	8.5 (6.0–9.0)
9	Menu listing healthy food that can be consumed during pregnancy	<ul style="list-style-type: none"> Provide a complete food menu with the intake schedule and nutritional value Try to present sample menus that are appropriate to the culture and habits of the Indonesian people 	9.0 (7.0–9.0)
10	Problems related to eating patterns that are often faced by pregnant women and their solution	<ul style="list-style-type: none"> Focus on health problems related to diet List complaints that often arise in pregnant women 	9.0 (7.0–9.0)
11	Tips on healthy eating for pregnant women with special health conditions	<ul style="list-style-type: none"> Include criteria for pregnant women who vegetarian 	9.0 (8.0–9.0)
12	Myths and facts related to eating patterns during pregnancy	<ul style="list-style-type: none"> Clarify the existing myths around pregnancy 	9.0 (0.0–9.0)
13	Recommendations for healthy eating in preparation for lactation	<ul style="list-style-type: none"> It is best to only discuss the recommended diet in preparation for breastfeeding 	9.0 (8.0–9.0)

DISCUSSION

The present qualitative study, which utilized information collected from pregnant women, the published literature, and experts,

proposes 13 topics that are relevant to healthy eating during pregnancy in the context of Jakarta, Indonesia: (1) The importance of healthy eating during pregnancy; (2) Food groups and serving sizes; (3) Nutrition requirements for pregnant women and the use of

multivitamins and supplements; (4) Foods that should be avoided/restricted during pregnancy; (5) Substances that should be avoided/restricted during pregnancy; (6) Weight gain during pregnancy; (7) Recommendations for physical activity and exercise; (8) Tips on selection, preparation, storage, and processing of food so that it is safe for consumption; (9) Menu listing healthy food that can be consumed during pregnancy; (10) Problems related to eating patterns that are often experienced by pregnant women and their solutions; (11) Tips on healthy eating for pregnant women with special health conditions; (12) Myths and facts related to eating patterns during pregnancy; and (13) Recommendations for healthy eating in preparation for lactation. The findings of this study are in line with the qualitative research conducted by Reyes (2013) on barriers and motivation in pregnant women in adopting healthy eating patterns [15]. In the Reyes (2013) study, the researcher identified the following relevant topics related to healthy eating during pregnancy, as presented in the following table (table 1). In addition, according to Oliveira (2014) [16], increased consumption of fruits, vegetables, grains and cereals, as well as a reduction in the consumption of fatty foods, sugar, and salt, were identified as important steps to healthy eating among pregnant women. Accordingly, recommendations for food intake were also identified as a relevant topic in the current study. Educational materials that are produced on topics that are relevant to a specific population should be obtained information from the appropriate sources in order for them to be beneficial for the target population [17, 18]. The study findings are expected to be pertinent for educators and creators of educational material on nutrition. Importantly, the modules thus developed would be useful for promoting healthy eating during pregnancy and therefore improving the overall health of the population.

Strengths and limitations of the research

This research used a development approach, wherein topics are identified based on the needs of the research subjects. Thus, information about the topic of healthy eating during pregnancy was obtained from pregnant women themselves. Additionally, we are not aware of any other study that has focused on the development of these topics using scientific and systematic methods in the context of Indonesia, especially with regard to healthy eating during pregnancy. Therefore, this research will act as a good point of reference for the development of relevant media and modules on this subject.

It is important to mention the limitations of this study too. The continuity of this research must be considered: As the subjects filled out the surveys online, the topics were also assessed using online tools, which require special skills in the use of electronic media. In order to make it easier for the experts to assess the topics, the questionnaires with the responses were printed out and sent them. In this way, they could still give an assessment on these topics. If the informants, both the experts and pregnant women, had been trained in the use of electronic media, the filling out of the questionnaires would have been easier, more practical, and faster.

CONCLUSION

The present study presents topics related to healthy eating during pregnancy, based on information from pregnant women (who were the research subjects) and published findings that are relevant. There was a topic correspondence between short surveys and literature studies. The topics were identified by experts in the related fields. The topics recommended could be used for improving nutrition education for health workers and, ultimately, nutrition information/education for future mothers.

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AUTHORS CONTRIBUTIONS

All authors have contributed equally.

CONFLICT OF INTERESTS

All authors have none to declare.

REFERENCES

1. Global Hunger Index. Global Hunger Index the challenge of hunger: Ensuring sustainable food security under land, water, and energy stresses; 2012.
2. Han CY, Colega M, Quah EPL, Chan YH, Godfrey KM, Kwek K, *et al.* A healthy eating index to measure diet quality in pregnant women in singapore: a cross-sectional study. *BMC Nutr* 2015;1:39.
3. Verbeke W, De Bourdeaudhuij I. Dietary behaviour of pregnant versus non-pregnant women. *Elsevier Appet* 2007;48:78–86.
4. Nada M, Dragon T, Bojana K. Nutritional analysis in women during pregnancy. *Res Rev DGT* 2015;44:183–93.
5. Global alliance for improved nutrition. Adolescent and maternal nutrition in Indonesia; 2014.
6. Lee SE, Talegawkar SA, Merialdi M, Caulfield LE. Dietary intakes of women during pregnancy in low-and middle-income countries. *J Public Heal Nutr* 2012;16:1340–53.
7. World Health Organization. WHO e-library of evidence for nutrition actions: Results of the 2014 user survey. Geneva, Switzerland: World Health Organization; 2014.
8. Mcgowan CA, Mcauliffe FM. Maternal nutrient intakes and levels of energy underreporting during early pregnancy. *Eur J Clin Nutr* 2012;66:906–13.
9. Nielsen JN, Gittelsohn J, Anliker J, O'Brien K. Interventions to improve diet and weight gain among pregnant adolescents and recommendations for future research. *J Am Diet Assoc* 2006;106:1825–40.
10. Yunendar W. Development of the smartphone (android) based learning module on information technology and communication subject at SMA Negeri 2 Makassar; 2016. p. 44–53.
11. Tsigga M, Filis V, Hatzopoulou K, Kotzamanidis C, Grammatikopoulou MG. Healthy eating index during pregnancy according to pre-gravid and gravid weight status. *Public Health Nutr* 2011;14:290–6.
12. Summerville J, Reid Griffin A. Technology integration and instructional design. *TechTrends* 2008;52:45–51.
13. Iswarawanti DN, Muslimatun S, Basuki E, Hadi A. Module development and its effectiveness for improving the competencies of voluntary health workers in communicating safe complementary feeding to caregivers in Indonesia. *Malaysia J Nutr* 2019;25:99–115.
14. Buchori I, Sugiri A, Maryono M, Pramitasari A, Pamungkas ITD. Theorizing spatial dynamics of metropolitan regions: a preliminary study in Java and Madura Islands, Indonesia. *Sustain Cities Soc* 2017;35:468–82.
15. Reyes NR, Rd MS, Mph AAK, Mph SJH. A qualitative study of motivators and barriers to healthy eating in pregnancy for low-income, overweight, African-American Mothers. *J Acad Nutr Diet* 2013;113:1175–81.
16. Oliveira SC De, Venícios M, Lopes DO. Development and validation of an educational booklet for healthy eating during pregnancy 1. *Rev Lat Am Enfermagem* 2014;22:611–20.
17. Demir F, Ozsaker E. The quality and suitability of written educational materials for patients. *J Clin Nurs* 2008;259–65.
18. Zombini EV, Pelicioni MCF. Strategies for Evaluation of an Educational Material in Eye Health. *Rev Bras Crescimento Desenvolv Hum* 2011;17:21:51–8.