JOURNAL OF APPLIED FOOD AND NUTRITION
Volume 1 Nomor 2, December 2020, 47-53

Available online at:
https://ejournal.upi.edu/index.php/JAFN

Supplementary Food during Pregnancy: Is It Really Beneficial for Mothers and Offsprings?

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ABSTRACTS

First 1000 days of life is a golden period and adequate maternal diet is needed to ensure optimal fetal growth. Supplementary food is known to have beneficial effects on providing nutrients for pregnant women. This article has an objective to elucidate supplementary food intervention throughout pregnancy and its beneficial effect on offsprings outcomes. Balanced energy protein supplementation and food distribution programme able to reduce the risks of maternal and offsprings complications, improve birth weight, and maintain maternal health.

ARTICLE INFO

Article History:
Received June 2020
Revised October 2020
Accepted October 2020
Available online December 2020

Keywords:
Supplementary Food Intervention; Pregnancy; Maternal Malnutrition; Fetal Growth

1. Introduction

Golden period occurs during the first 1000 days of life which started from pregnancy period until two-year of life. Adequate maternal diet is important to ensure optimal fetal growth and development[1]. Disturbance during this period will result in many complications that lead to lifelong effects, such as growth restriction, health issues, even mortality. Maternal nutritional and health status should be prioritized in order to reduce complications both for mothers and offsprings[2;3]. One of the ways to provide maternal nutritional needs during pregnancy is through supplementation intervention[4]. Mothers with nutritional disorders, especially low body mass index (BMI) or undernutrition and micronutrient deficiencies are the priorities for this action[5]. Supplementary food is known to have beneficial effects on providing nutrients to the fetus, and support optimal fetal growth. This article has an objective to elucidate supplementary food intervention throughout pregnancy and its beneficia effects on offsprings outcomes.

2. Methods

The PubMed, Science Direct, and PMC database were searched on April 14, 2021, using the following terms 'supplementary food intervention', 'pregnancy', 'maternal malnutrition' and 'fetal growth' in the abstract field, and 28 articles were retrieved. Other than scientific articles, National Health Reports on 2013 and 2018 from Ministry of Health were also retrieved. Data extraction and analysis was done by gathering and extracting applicable information from the primary study. The relevant and important information were used in the process of writing this review.

3. Results and Discussion

3.1. Maternal Complications and its Effects on Offsprings

Optimal nutrition has important role before, during, and after pregnancy[6]. Additional nutrient requirements are needed to provide maternal physiological changes during pregnancy. Undernourishment tend to occur for a long period of time, before the conception. Chronic energy deficiency (CED) is a nutrition disorders in pregnant women who has mid-upper arm circumference (MUAC) below 23.5 cm[7]. A prolonged inadequate calories intake and food consumption with low nutrient quality are the major factors of CED. Other than MUAC, maternal nutritional status could also determine CED. Maternal with BMI less than 18.5 kg/m^2 is classified as underweight and have higher risks to have pregnancy complications. These problems are prevalent in low- and middle-income countries[8]. Poor maternal nutritional condition may increase the risks of restrict fetal growth and development, or even worse, infant mortality.

CED increase the risks of maternal health complications, such as anemia, pre-eclampsia, placental abruption, infection, and maternal mortality[9;10]. Anemia and CED are interrelated. Anemia increase the risk of CED occurrence, vice versa. Maternal CED have 2.76 times risk to suffer from anemia. Moreover, longer gestation age has higher chance to suffer from anemia compared to the first and second trimester of pregnancy[11;12]. Anemia is the primary cause of maternal mortality during pregnancy. Approximately, around 40% of maternal mortality in developing countries occur because of anemia.

Fetal growth and development are determined by several factors, such as maternal

nutritional status and body compositions, metabolism, and nutrient intake for fetus[1]. Inadequate dietary intake throughout pregnancy will restrict fetal growth and can later lead to chronic diseases in adult life[2]. Moreover, poor maternal nutritional status and dietary intake is a risk factor of fetal complications and outcomes, including preterm birth, low birth weight, obesity, coronary heart disease, and stunting[13;14;15]. Stunting is a growth failure in children under five-year-old[16]. The prevalence of stunting is still high, especially in developing countries. 1/3 of toddlers in Indonesia (30.8%) are classified as stunting[17]. Stunting may obstruct productivity in the later life[18].

3.2. Supplementary Food Intervention

The main factor of maternal malnutrition is prolonged inadequate dietary intake and food consumption with low nutrient quality. In low- and middle-income countries, diets lack of foods rich in essential macronutrients and micronutrients that are often found in fish, poultry, and meat[19]. Several macronutrient supplementation interventions were conducted in order to optimize maternal nutritional needs, especially for undernourished pregnant women in low- and middle-income countries. The interventions include micronutrient supplementation which has an objective to prevent maternal anemia, preterm birth and low birth weight[9]. Intervention should be administered as soon as possible to present beneficial effects[12].

The type of supplementation interventions that have been proposed including balanced energy protein supplementation and food distribution program. Balanced energy protein supplementation is a macronutrient food-based supplement where protein provide less than 25% of total energy content[20]. This program is the most ideal supplementary intervention and has positively related in reducing harmful pregnancy outcomes, such as intra-uterine growth retardation and low birth weight[21;22]. Balanced energy protein supplementation is a well-developed program and contributes to improve maternal, neonatal, and child outcomes, that measured by nutritional status, morbidity, mortality, and biochemistry status.

Food distribution programmes provide access to supplemental nutritious foods and nutrition education for nonpregnant and pregnant women in developing countries[23]. These programmes are usually run by local or international social organizations that have an objective to improve nutritional knowledge and provide healthcare services and supplementary foods. The long-term goals are to improve knowledge in maternal and newborn care, in order to reduce the rate of neonatal mortality[23;24]. These programmes also provide maternal counselling to give information about healthy diets, the importances and risks of poor nutrition, and also to provide tools and knowledge necessary to maintain good antenatal health[25]. The programmes are conducted by collaborating with local community health center, in order to simplify the services, such as foods distribution, immunizations, promotion of maternal health and neonatal care. These strategies have been shown to be effective in reducing neonatal mortality and maternal anemia[23;26].

Indonesia also provide these intervention programmes for pregnant women, such us by distributing supplementary foods in the form of biscuits, iron supplementation, and milk. Nutrition education is conducted to improve nutritional intake and maintain healthy lifestyle[27]. Supplementary foods were given to CED pregnant women, with MUAC less than 23.5 cm and distributed from antenatal healthcare services. Supplementary foods consist of three pieces of biscuits weighed 60 grams. For mothers in early term of pregnancy, two pieces were given, whilst mothers in middle and late term of pregnancies were given three pieces of biscuits until

their MUAC have increased[5]. Other than supplementary foods, non-profit organizations also did intervention programmes for pregnant women, namely food distribution programmes, micronutrients supplementations, and supplementary food fortification[28].

3.3. Benefits of Supplementary Foods Intervention

Supplementary foods interventions have beneficial effects for maternal and offsprings. Balanced energy protein supplementations are bound to give improvement on maternal health and pregnancy outcomes. Balanced energy protein supplementation reduce 40% of low birth weight risks (weight less than 2500 gram) (RR 0.60; 95% CI 0.41 to 0.86), improve birth weight (MD 107.28, 95% CI 68.51 to 146.04), and reduce the incidence of small-for-gestational-age births up to 29% (RR 0.71; 95% CI 0.54 to 0.94). however, improvement in birth length is still insignificant (MD 0.28; 95% CI -0.36 to 0.92) and do not impact on preterm births (RR 0.86, 95% CI 0.50 to 1.46)[29]. One study on balanced energy protein supplementation in low- and high- income countries, showed reduce risks in stillbirth and small-for-gestational age[30]. Other study also showed similar results, and improvement on birth weight[31].

Although the systematic review on food distribution programme during pregnancy in low- and middle- income countries is not yet conducted, this programme still give many beneficial effects for maternal and offsprings. It showed an improvement on reducing perinatal mortality risks up to 33% % (RR 0.67; 95% CI 0.41 to 1.09), reduce low birth weight risk up to 8 % (RR 0.92, 95% CI 0.84 to 1.00), improve birth weight up to 46 grams (MD 46.00, 95% CI 45.10 to 46.90), and improve mean birth length up to 0.2 cm (MD 0.20, 95% CI 0.20 to 0.20). Food programme trials also showed reduction of stunting and wasting incidents significantly up to 18% (RR 0.82, 95% CI 0.71 to 0.94) and 13% (RR 0.87, 95% CI 0.78 to 0.97) sequentially[29].

Supplementary food intervention provide improvement both for mothers and offsprings. However, this intervention only gives favorable benefits for undernourished pregnant women. Balanced energy protein supplementation for normal pregnant women gave insignificant impact on birth weight improvement and reduced risk of low birthweight[20]. Improvement on offsprings' body height could be attained with optimal maternal health and nutritional status, also supported with decent access to healthcare center[21].

3.4. Supplementary Food Intervention in Indonesia

Indonesia government programmes to improve maternal nutritional and health status are supplementary food and iron supplementation. The distribution of maternal supplementary food is not comprehensive yet, as it is shown in Indonesia Health Report which stated that approximately only 37.4% of CED pregnant women who receive this supplementary food. Meanwhile, iron supplementation should be distributed to all pregnant women in the country, but only 73.2% of pregnant women receive this supplementation, and only 24% of them who consume properly[17]. Supplementary food has a role in providing additional nutrients which not yet granted through maternal consumption. It does not replace the main sources of nutrition through food consumption. Inadequate nutrients intake throughout pregnancy will reduce maternal energy reservation, and it will inhibit nutrients transport to fetus[32]. A study showed that there were mothers who consume supplementary food incorrectly, as they consumed it as the main food sources[33].

Poor understanding and monitoring on supplementary food consumption practice will result in insignificant effects to maternal and offsprings. Poor supplementary food distribution

system contributes to high prevalence of CED and anemia in pregnant women, namely 24.2% and 48.6%, respectively[17]. A study showed CED pregnant women had high compliance on supplementary food consumption up to 85.3% and result in MUAC improvement up to 1.41 cm when monitored for two months[34]. Improvement on maternal nutritional status could be attained if supplementary food distribution and monitoring is effective and thorough.

5. Conclusions

The main factors that determine fetal growth are maternal nutritional status and adequate nutrients intake throughout pregnancy. Inadequate intake will increase maternal and offsprings complications. Supplementary foods give beneficial effects both for mothers and children if conducted accordingly. However, optimal maternal diet intake from nutritious foods should be prioritize to pursue optimal fetal growth and maintain maternal health. A further study about the consensus on the best time to start supplementation and its monitoring system should be conducted.

6. Acknowledgment

None. No funding to declare.

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