A Meta Analysis Study of Nutrition and Physical Fitness During Pregnancy

Ilham[1], Wara Kushartanti[1]
[1]*Faculty of Sport Sciences, Yogyakarta State University, Jl. Colombo No. 1 Yogyakarta, Indonesia*

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Abstract: Malnutrition as the lack or the abundant flow of macro- and micronutrients increases the risk of gestational anemia, hypertension, miscarriages and fetal deaths during pregnancy, pre-term delivery and maternal mortality. For newborn, it can cause low birth weight, fetal intrauterine growth retardation. The purpose of this study is to identify macro- and micronutrients which are needed to decrease the risk of gestational anemia, hypertension, miscarriages and fetal deaths during pregnancy, to influence of sport on the pregnancy. Methods used include Meta analyse study with literature review of 20 articles published in different international journal related to Nutrition and sport science indexed Scopus from Q4 and by random sampling. The data were analysed according to the general epidemiology of malnutrition. Results show the Lack or surplus of adequate nutrition of good quality and quantity during pregnancy can cause health problems for both the mother and her fetus. The effect of Exercise on Pregnancy is Positive. Exercises during pregnancy help to alleviate many of the common problems of pregnancy. It improves circulation, which helps prevent constipation, hemorrhoids, varicose veins, leg cramps, and swelling of the ankles, physical exercise is very important on the pregnancy during delivery and to improve the wellbeing.

1 INTRODUCTION

The problem of balanced nutrition in Indonesia is still a fairly serious problem, specifically in pregnancy women (Beal *et al.*, 2018). Lack or excess food during pregnancy can have adverse effects on physical fitness for the mother and fetus. Physical Fitness is the body's ability to perform various activities properly without experiencing fatigue (Castelli, Hillman, Buck, & Erwin, 2007; Shahana, Nair, & Hasrani, 2010; Hashmi et al., 2018). After doing activities optimally, the body still has a reserve of energy to continue activities. In general, physical fitness can be classified into two parts, namely: the first Healthy, namely the condition in which the body (physical and psychological) is free from all subsequent diseases: Second Fitter is a condition where the body is able to carry out various daily activities optimal without fatigue, and still has power reserves (Sawczuk *et al.*, 2018).

Balanced nutrition and exercise are the keys of healthy living (Sousa, Teixeira and Soares, 2014). But (Smith, Holmes and McAllister, 2015), their research showed that during pregnancy, exercise is one of the important things that can help pregnancy to maintain her body healthy, especially if pregnancy is still in the first trimester. Regular exercise can help her to reduce sickness and can improve function as a form of preparation for childbirth (Charkamyani *et al.*, 2019). The benefits will not only be felt by the mother, but also felt by the fetus (Wang *et al.*, 2015). The health condition is always based on a balance between Intake and Out put. Since long ago, the food of pregnant women has been considered very important, because people believe that the right food will have a good impact on the fetus. Therefore, people make various rules of food that may be consumed by pregnant women (Nana and Zema, 2018), and foods that are taboo, which is apparently not true at all in terms of health. For example, pregnant women should not eat a lot with the aim that the baby is not big and easily born.

Nutritional status and type of exercise for the mother before and during pregnancy can affect the growth of the fetus and can also maintain and improve maternal physical fitness (Mudd *et al.*, 2013) . The normal nutritional status of the mother before and during pregnancy is likely to give birth to

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a healthy baby, just a month with a normal body weight. In other words, babies born are very dependent on the state of nutrition and physical activity performed by the mother before and during pregnancy. During pregnancy, the need for nutrients increases (Bø *et al.*, 2016). This is needed to meet the growth needs of the fetus, maintain maternal health, and supply lactation for both the mother and fetus (Greenhill, 2016).

A study from (Hazart *et al.*, 2017) showed that nutritional deficiencies can result an anemia, abortion, prematurous delivery, uterine inertia, postpartum bleeding, puerperal sepsis, and others. Excess of nutrition can result in obesity, pre-existing lamsia, large fetuses, and others. Maternal nutrition during pregnancy is very important for the growth of the fetus it contains. The incidence of LBW (Low Birth Weight) is higher in developing countries than in developed countries. This is due to low social and economic conditions affecting the mother's diet. Good maternal nutrition is needed so that fetal growth runs rapidly and does not experience obstacles. Starting from one egg after fertilization then it grows rapidly. So, it is estimated that the growth of the fetus from conception to birth (Bookari, Yeatman and Williamson, 2017).

Malnutrition is currently a problem of concern in Indonesia. It is a problem that needs attention, because it can cause the lost generation. The quality of the nation in the future will be greatly influenced by the current state or nutritional status, especially toddlers. Poor nutrition and lack of nutrition for

someone would affect the quality of life later. Malnutrition is still quite alarming based on the problem above. The aims of this study are to identify macro- and micronutrients which are needed to decrease the risk of gestational anemia, hypertension, miscarriages and fetal deaths during pregnancy, and to influence the sport on the pregnancy. This study is very important because it gives a guideless of nutrition for pregnancy and Effects of Exercise on Pregnancy and fetus.

2 METHODOLOGY

This research is a Meta analyse study with literature review of 20 articles published in different international journals related to Nutrition and sport science indexed Scopus from Q4 and above by using random sampling. The data were analysed according to the general epidemiology of malnutrition. We analysed articles by age to find out and show how research on malnutrition of pregnancy has evolved, to facilitate readings, and researchers to see angles that are not yet solicited by research. This literature review was to identify macro- and micronutrients which are needed to decrease the risk of gestational anemia, hypertension, miscarriages and fetal deaths during pregnancy, and the influence of sport on the pregnancy.

3 RESULTS

Table 1: Free Nutritional Needs of Pregnant Women

Food Material	First Trimester	Trimester II and III
Rice / Exchanger	3¼ cups	3½ cup
Meat / exchanger	2½ cut	½ pieces
Tempe / Exchanger	5 pieces	5 pieces
Vegetable	3 cups	3 cups
Fruit	2 pieces	2 pieces
Oil	2 tbsp	2 tbsp
Green beans	½ tbsp	½ tbsp.
Milk	½ tbsp	½ tbsp.
flour sarikedelai	-	4 tbsp
Sugar	1 tbsp	1 tbsp
Nutritional Value	First Trimester	Trimester II and III
Energy	2095.8 cal	2164.5 cal
protein	79.5 grams	82.5 grams
Fat	57 grams	65 grams
Carbohydrate	273.8 grams	275 grams
Vitamin C	70 mg	70 mg
Iron	31 mg	31 mg

This table showed how pregnancy should consume food according to the different trimesters. The main menu is constitute with (1) carbohydrate, (2) fat, (3) protein, (4) mineral, (5) vitamin and (6) drinks.

Carbohydrate: The table above showed that the food which contains carbohydrates is very important for the pregnancy and the fetus. The fetus has about 9 g of carbohydrates at week 33 of pregnancy, and at birth it increases to 34 g. The concentration of glycogen in the liver and skeletal muscles increases at the end of pregnancy. The carbohydrate metabolism of pregnant women is very complex because there is a tendency to increase dextrose excretion in urine. This is indicated by the relatively high frequency of glycosuria in pregnant women and the presence of glycosuria in most pregnant women after receiving 100 grams of dextrose per oral. Normally, in pregnant women, there is no glucose. Carbohydrate needs are approximately 65% of total calories, so you need to add protein (Institute of Medicine, National Academy (2005)).

Protein: Food which contains protein is very needed to build the baby, to protect pregnancy and foetus from diseases. Protein transport through the placenta is mainly amino acids, which are then synthesized by the foetus into tissue proteins. Protein is needed for foetal growth, uterus, breast, hormones, addition of maternal blood fluids, and lactation preparation. Protein requirements are 9 grams / day. 1/3 of animal protein has a high biological value (Institute of Medicine, National Academy (2005)). Protein requirements for the foetus are 925 grams for 9 months. The protein efficiency is 70%. There is protein loss in urine + 30%. WHO recommends protein intake for pregnant women around 1.01 g / kg. BB / day and calories around 46 kcal / kg.BB / day for the average woman weigh 55 kg.

Fat: During pregnancy, there is 2-2.5 kg of fat and the increase starts from the 3rd month of pregnancy. The addition of fat is unknown, but it is likely to be needed for future lactation. 500 g of foetal body fat is stocked between week's 35-40 pregnancies. In the early stages of pregnancy, there is no fat accumulated except essential lipids and phospholipids for growth of the central nervous system (CNS) and nerve cell walls. Until mid-pregnancy, only about 0.5% of fat in the body of the foetus, after which the number increases, reaches 7.8% at 34 weeks and 16% before birth. In the last month of pregnancy, around 14 g of mother's milk per day are piled up. Fatty acid transport through the placenta is about 40% of maternal fat; and the rest is synthesized by the foetus. Both fat and protein increase rapidly in the last three months of pregnancy along with increased foetal weight. Most of the fat is deposited in the subcutaneous area; therefore 80% of body fat tissue is present in body infants in subcutaneous tissue. So, there is a great need of fat for the pregnancy.

Iron (Fe): Needed for haemoglobin, (Hb) formation, especially hem dilution, intake must be sufficient during pregnancy in order to prevent anaemia. Pregnant women need 800 mg or 30-50 grams / day (Irianto, 2017). Maximum recommendations: additions from the beginning of pregnancy, because administration of only the third trimester cannot pursue the needs of the mother / fetus and also for foetal reserves. Iron requirements increase, so that it takes an additional 700-800 mg or 30-60 mg per day obtained from supplements to replace iron use by the bone marrow, foetus, and placenta. Pregnant women who are anaemic due to iron deficiency will have an impact on increasing spontaneous abortion, early birth, low birth weight (LBW), infant mortality at birth, and infant mortality before birth. Iron sources are obtained from the liver, bone marrow, eggs, meat, fish, chicken, and dark green vegetables.

Calcium (Ca): Calcium needs in pregnant women have increased due to an increase in bone turnover (turn over), decreased calcium absorption, and calcium retention due to hormonal changes. Calcium is needed for the growth of bones and teeth, vitamin D helps to absorb calcium, needs 30-40 g / day for the foetus, pregnant women need an additional 600 mg / day and the total need for pregnant women during pregnancy is 1200 mg / day. Calcium can be obtained by consuming milk, cheese, anchovy, dried dried or wet soybeans, and fresh broccoli (Irianto, 2017).

Supplement: Multivitamin and mineral supplements are supplements that contain a combination of vitamins and minerals, and do not contain other active ingredients. Vitamin and mineral supplements are recommended to contain at least 10 vitamins or minerals with varying doses, which can be vitamin C, vitamin B complex, vitamin D, zinc, selenium, magnesium, iron and calcium (Irianto, D. J. 2017). The Role of Multivitamin Minerals in Physical Fitness The role of vitamin minerals is as an antioxidant which greatly affects the quality of human life. Some mineral vitamins have a role as antioxidants are vitamin E, vitamin C, vitamin A, selenium, iron and zinc. These substances are often called antioxidant nutrients (Yaya *et al.*, 2018).

How do you exercise during pregnancy?: Exercise is needed during pregnancy; its function is for maternal and fetal fitness (Gregg and Ferguson, 2017). Besides that, there are several types of exercise such as yoga that trains breathing to help mothers relax, relieve stress, fatigue, calm the mind and train mothers to control breathing well because during the pregnancy process maternal breathing arrangements are very essential (Wen, Flood, Simpson, Rissel, & Baur, 2010; Babbar & Chauhan, 2015). Besides yoga, Pilates are quite popular with pregnant women. Pilate's exercises are focused on the hips in the hope of being able to train the mother's hips to be more flexible during the birth delivery process. Kegel is also included in the exercise during the pregnancy process. Kegel exercises focused on female organs to be prepared when facing the pregnancy process. And the latest is exercise in water (aerobics-aquatic) (Riaz *et al.*, 2018). Besides that, Active video games or exercise apps have the potential to overcome some of the barriers to exercise, while pregnant as addition to

enhance the motivation factors in encouragement doing physical activity (Trevorrow, 2016). In addition, (Ruchat *et al.*, 2012) Prenatal nutrition and exercise program however of exercise intensity, reduced excessive gestational weight gain (GWG) and decreased weight storage at 2 mopp in women of normal weight before pregnancy.

Increasing Body Energy: However, pregnant women still need to do regular exercises so that her body is always fit and energized. This is because, exercising regularly, can strengthen the cardiovascular system, and make the mother not easily tired. That is why, with stronger and more formed muscles, she can do various daily activities with increased energy. No need to exercise too hard, just do a light activity such as walking around the area of residence, approximately 20 minutes three times per week.

Reducing discomfort during pregnancy: During pregnancy, daily activities become more difficult because of the increased body weight. This increased weight, often causes discomfort, such as feeling tired easily, back ache, morning sickness, and so forth (Nana and Zema, 2018). Well, pregnancy can reduce the discomfort by exercising regularly. The muscles might experience stretching and adjustments to make the body stronger and tolerant of the pain experienced during pregnancy. Running, for example, can help you improve blood circulation or you can choose to swim to strengthen your abdominal muscles. By minimizing the discomfort that arises, the development of the foetus in the womb can also be maintained properly.

Helping Facilitate Labor: The course of labor will be largely determined by the condition of the body of the mother. The better the stamina, the stronger the body will be to undergo labor. That is one of the main reasons, why exercise regularly is recommended as a form of preparation for childbirth (Nana and Zema, 2018).

Improving Sleep Quality: The size of the stomach, certainly affects the daily activities, one of them is when sleeping. It feels like the eyes are hard to close, because you have to try to find a comfortable position, both for the mother and the fetus. (Castelli *et al.*, 2007) Well, one way to overcome this is to exercise. As mentioned earlier, exercises would indeed make you feel tired, but it is precisely this feeling of fatigue that will make you able to fall asleep faster and soundly. The quality of sleep increases and the health of the mother during pregnancy would be maintained before the birth of the children.

Optimizing Foetal Brain Development: In addition to increasing maternal stamina, regular exercise can also maintain foetal development in the womb. Based on a study presented at the Society for Neuroscience, San Diego, ten-day-old babies have better brain maturity levels if their mothers diligently exercise during pregnancy compared to those who do not. This would have an impact on the Little's hearing, vision, and motor skills in the future of growth so that they are more maximal. Mothers can try to start exercising regularly, as a form of preparation for childbirth. Mothers can walk, swim, or take yoga classes at hospitals or various studios that are now widely available. However, before starting, you should first consult your obstetrician so that you can exercise safely (Riaz *et al.*, 2018).

4 DISCUSSION

High food quality, together with adequate macro- and micronutrient intake in pregnancy, is crucial for the health status of the mother and child, the result from the research above showed that (1) carbohydrate, (2) fat, (3) protein, (4) mineral, (5) vitamin and (6) drinks are the common food needed to take care for pregnancy and foetus.This review provides researchers and practitioners with an overview of the physical activity and pregnancy literature to promote prenatal physical activity, improve measurement, further elucidate the role of activity in reducing maternal health complications, and inform future research.

To assess the effects of advising healthy pregnant women to engage in regular aerobic exercise (at least two to three times per week), or to increase or reduce the intensity, duration, or frequency of such exercise, on physical fitness, the course of labour and delivery, and the outcome of pregnancy (Kramer and McDonald, 2009).

There is a direct link between healthy mothers and healthy infants. Exercise and appropriate nutrition are important contributors to maternal physical and psychological health. The benefits and potential risks of exercise during pregnancy have gained (Prather, Spitznagle and Hunt, 2012).

During pregnancy, such as hyperthermia, shortened gestational age and decreased birth weight are not supported by the most recent scientific reviews. The physiological adaptations to exercise during pregnancy appear to protect the foetus from potential harm and, while an upper level of safe activity has not been established, the benefits of continuing to be active during pregnancy appear to

outweigh any potential risks. All decisions about participation in physical activity during pregnancy should however be made by women in consultation with their medical advisers (Brown, 2002). The amount of time pregnant women spend in moderate-vigorous physical activity or volitional exercise varies drastically depending upon what guideline is used.

5 CONCLUSION

Nutritional adequacy is essential in ensuring the normal growth and development of the fetus. Perceived benefits will be able to strengthen pregnant women to meet optimum nutritional intake to prevent anemia. Adequacy of protein, vitamin C and iron will reduce the risk of iron deficiency anemia in pregnancy. This study aims to examine the association between perceived benefits with protein, vitamin C, and iron intake in preventing pregnancy anemia. Healthy weight and healthy lifestyle behaviours are considered as essential prerequisites for a successful pregnancy. The importance of maternal lifestyle includes nutrition and physical activity in relation to the short- and long-term birth. Therefore each country can make recommendations that are specific to the food patterns in the country and the circumstances of the people. The amount of basic food recommended in the table must be adjusted to the biological value of the human body. Maternal nutrition during pregnancy is of considerable interest to women, their partners and their health care professionals; however, it is a complex issue. In developing countries, maternal malnutrition is a major concern. However, with the increased prevalence of overweight and obesity in developed countries, the impact of abundant high calorie diet upon pregnancy outcome is of interest and practitioners should also consider the multifaceted determinants and outcomes of prenatal physical activity and intervening to promote physical activity before, during, and after pregnancy.

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