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Food suggestions, meal frequency, and dietary diversity among pregnant women: a quantitative study in Madura

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During pregnancy, the nutritional requirement increases. Therefore, many nutritious foods (diverse food groups) are suggested for pregnant women. This study aimed to explore the association between food suggestions and meal frequency with dietary diversity among pregnant women. This research was a cross-sectional study conducted in 2017 in Sumenep Regency in the Eastern Madura Island, East Java Province, Indonesia. There were 282 pregnant women involved in this study. This survey presents a quantitative study of food suggestions for pregnant women. The minimum dietary diversity for women assessed dietary diversity. A coefficient contingency was done to analyse the association between variables. Most pregnant women eat 2-3x/day. More than half of pregnant women have a food suggestion (57.4%) and reach minimum dietary diversity (56%). There was a tendency that higher meal frequency contributes to higher dietary diversity but not significantly associated (p=0.214). There was a significant association between food suggestions and dietary diversity (p=0.003). Indigenous knowledge, such as food suggestions has a beneficial effect on pregnant women's diets. Pregnant women need to follow the food suggestions so they can have a good and diverse diet.

1. Introduction

Nutritious food is widely recommended for pregnant women to improve the health of the mother and their babies. However, in communities that still adhere to customs and beliefs related to food such as Madurese in East Java, Indonesia, food taboos still exist and are avoided by pregnant women. A qualitative study by Diana et al. (2018) showed that most pregnant women did not consume taboo food because they worried it could affect maternal and infant health. Indigenous knowledge shows that many nutritious foods are suggested for expectant mothers but do not contradict the prevailing taboo food in the area. These foods are usually recommended by families or communities who believe that certain foods can increase their nutrient intake and facilitate the process of pregnancy and birth (Diana et al., 2018).

During pregnancy, the nutritional requirements in-

crease to meet physiological and metabolic demands for both mother and the fetus (Danielewicz et al., 2017; Zeng et al., 2017). In many countries, it is challenging for pregnant women to have adequate intakes of macro and micronutrient (Asayehu et al., 2017; Bailey et al., 2019; Dubois et al., 2017; Madanijah et al., 2016; Nguyen et al., 2018). Therefore pregnant women should enhance their dietary quantity and quality (Danielewicz et al., 2017). Low dietary intakes lead to malnutrition among pregnant women, namely undernutrition, chronic energy deficiency (CED) and anaemia. CED (20.7%) and anaemia (48.9%) are still public health problems in Indonesia (Ministry of Health, 2019).

Enhancing dietary quantity and quality can be achieved through the increasing meal frequency (Murakami & Livingstone, 2016; Yeneabat et al., 2019). In general, in the early stage of pregnancy, women eat less frequently than at the end stage of pregnancy. Meal frequency contributes to adequate dietary intake for pregnant women (Danielewicz et al., 2017). Mothers in the first trimester, usually having nausea or vomiting (Bustos et al., 2017); therefore, they cannot consume a significant amount of food during one meal. They eat less but more frequent meals in their first trimester (Dubois et al., 2017). Dietary diversity has been considered to become a proxy for nutrient adequacy (Rathnayake et al., 2012). Dietary diversity is determined by the socioeconomic status, meal frequency, and food access (Desta et al., 2019; Yeneabat et al., 2019).

Various forms and reasons for food suggestions exist in several countries. For example, pregnant women in Madura Island, Indonesia were encouraged to consume fruits, vegetables, and drinks (coconut water) because it is believed their consumption could help in various ways. These foods are believed to eliminate toxins, ease the delivery process, support healthy newborn babies, and clean the baby's skin (Diana et al., 2018). Similarly, animal food rich in protein was also recommended for pregnant women in other countries (Nag, 1994). Food suggestions have the potential to support nutrition education for pregnant women, particularly in a region where food taboos still exist (Diana et al., 2018).

A study about the association of meal frequency and dietary intake was done in Ethiopia by Yeneabat et al. (2019). Dietary diversity determinants and their relationship with dietary intake were revealed by Kiboi et al. (2017). However, there are no studies about the association of food suggestions, meal frequency, and dietary diversity among pregnant women, particularly in Indonesia. Therefore, this study aimed to explore the association between food suggestions and meal frequency with dietary diversity of pregnant women.

2. Methods

This research was a cross-sectional study conducted in 2017 in Sumenep Regency in the Eastern Madura Island, East Java Province, Indonesia. This article presents a quantitative study of food suggestions for pregnant women. Meanwhile, the qualitative study can be seen in another publication (Diana et al., 2018).
The population of this research was all pregnant women in four community health centres, three sub-districts, 25 villages in Sumenep Regency, Madura Island, East Java. The sample size of the pregnant women was determined by a formula sample size to estimate the proportion in the population with absolute precision (Lwanga & Lemeshow, 1991). The total population was 411 pregnant women. The minimum number of samples required was equal to 282 pregnant women. The sampling data of pregnant women were obtained from the local community health centre and village midwives. From this sampling data, a simple random sampling with proportional allocation was used to choose the selected sample according to the inclusion criteria. The inclusion criteria were pregnant women aged 18-49 years, not having a special diet, and willing to participate in this study by signing informed consent.

Data collection (pregnant women characteristics, food suggestions, and meal frequency) was done by trained enumerators and supervised by researchers. Data were collected through interviews using a structured questionnaire by trained enumerators. Dietary diversity was assessed by Minimum Dietary Diversity for Women (MDD-W) that consisted of 10 food groups (grains, white roots and tubers and plantains, pulses, nuts and seeds, dairy, meat, poultry, and fish, eggs, dark-green leafy vegetables, vitamin A-rich fruits and vegetables, other vegetables, and other fruits) (FAO and FHI 360, 2016). Coefficient contingency was done to analyse the association between variables.

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This research was approved by the Health Research Ethics Committee, Faculty of Public Health, Universitas Airlangga No. 1-KEPK. The research was performed in concord with approved ethical clearance. All participants had signed informed consent before the data were collected.

3. Results

Table 1 shows that most pregnant women categorised as middle-aged. In general, the respondents were experiencing a second pregnancy, except for those who were in their third trimester (having the first pregnancies). The education level of pregnant women was quite diverse. Almost half of them (46.1%) had a basic education, and 35.1% were graduated from high school. More than half of the respondents were classified as a small family, and more than a third of pregnant women classified as a medium family. The mean of total household expenditures were IDR 545,992/cap/month or equal to $39/cap/month (1 USD = 14,000 IDR).

Table 1. Characteristics of pregnant women [n (%)]

Characteristics	1st Trimester (n=37)	2nd Trimester (n=112)	3rd Trimester (n=133)	Total (n=282)
Age (years)				
- ≤20	6 (16.2)	17 (15.2)	22 (16.5)	45 (16)
- 21-35	31 (83.8)	86 (76.8)	98 (73.7)	215 (76.2)
- 36-40	0 (0)	8 (7.1)	11 (8.3)	19 (6.7)
- >40	0 (0)	1 (0.9)	2 (1.5)	3 (1.1)
History of pregnancy				
- First	11 (29.7)	39 (34.8)	56 (42.1)	106 (37.6)
- Second	20 (54.1)	52 (46.4)	48 (36.1)	120 (42.6)
- Third	5 (13.5)	12 (10.7)	23 (17.3)	40 (14.2)
- Fourth	1 (2.7)	5 (4.5)	5 (3.8)	11 (3.9)
- Fifth	0 (0)	4 (3.6)	1 (0.8)	5 (1.8)
Education (years)				
- Basic Education (≤9)	12 (32.4)	51 (45.5)	67 (50.4)	130 (46.1)
- Middle Education (10-12)	17 (45.9)	36 (32.1)	46 (34.6)	99 (35.1)
- Higher Education (>12)	8 (21.6)	25 (22.3)	20 (15.0)	53 (18.8)
Number of family members (persons)				
- Small (≤4)	23 (62.2)	66 (58.9)	78 (58.6)	167 (59.2)
- Medium (5-7)	14 (37.8)	39 (34.8)	45 (33.8)	98 (34.8)
- Large (>7)	0 (0.0)	7 (6.3)	10 (7.5)	17 (6.0)
Expenditure (mean IDR/cap/month)				
- Food	265,708	225,137	246,794	240,674
- Non-food	314,280	279,963	324,176	305,318
- Total	579,988	505,100	570,970	545,992

3.1. Meal Frequency

Dietary habits can be reflected by the daily frequency of food consumption of a pregnant woman. The higher the eating frequency of the pregnant woman, the better it is because this habit can fulfil the increasing nutritional requirement. The eating frequency among the three groups of pregnant women had the same pattern (Table 2). More than half of the pregnant women reported eating 3 times/day, one-third of them ate 2 times/day, and few others had eating frequency <2x/day or ≥ 4x/day. A low proportion of pregnant women ate more quantities and more frequently in the first trimester.

The most influential person toward the food consumption of pregnant women in the first trimester was the husband (Table 2). In the first trimester, the role of a husband in determining the respondents' food consumption was more dominant (56.8%) compared to the respondents themselves (27.0%). The husbands' influence on pregnant women's food consumption decreases as the pregnancy progresses. Among the pregnant women in the second trimester, the level of influence begins to shift from husband (39.3%) to the pregnant women themselves (38.4%). Among the pregnant women in the third trimester, the role of a husband in determining food consumption decreases further. The pregnant women were more dominant in determining their food consumption compared to others (including their husbands). The influence of mother and mother-in-law toward the consumption was less significant in the first trimester but increased steadily in the following trimesters (Table 2).

3.2. Food Suggestions

Food sources of carbohydrates, proteins, vitamins,

Table 2. Distribution of pregnant women by dietary habit [n (%)]

Dietary habit	1st Trimester (n=37)	2nd Trimester (n=112)	3rd Trimester (n=133)	Total (n=282)
Meal frequency				
- <2x/day	1 (2.7)	2 (1.8)	2 (1.5)	5 (1.8)
- 2x/day	13 (35.1)	33 (29.5)	41 (30.8)	87 (30.9)
- 3x/day	19 (51.4)	67 (59.8)	74 (55.6)	160 (56.7)
- 4x/day	3 (8.1)	8 (7.1)	14 (10.5)	25 (8.9)
- >4x/day	1 (2.7)	2 (1.8)	2 (1.5)	5 (1.8)
The difference between a pre-pregnancy and while-pregnancy dietary habit				
More amount				
- Yes	10 (27.0)	50 (44.6)	69 (51.9)	129 (45.7)
- No	27 (73.0)	62 (55.4)	64 (48.1)	153 (54.3)
More frequent				
- Yes	12 (32.4)	51 (45.5)	64 (48.1)	127 (45.0)
- No	25 (67.6)	61 (54.5)	69 (51.9)	155 (55.0)
The most influential person toward the food intake of pregnant women				
- Husband	21 (56.8)	44 (39.3)	42 (31.6)	107 (37.9)
- Themselves	10 (27)	43 (38.4)	56 (42.1)	109 (38.7)
- Mother	3 (8.1)	21 (18.8)	25 (18.8)	49 (17.4)
- Mother in law	2 (5.4)	2 (1.8)	7 (5.3)	11 (3.9)
- Others	1 (2.7)	2 (1.8)	3 (2.3)	6 (2.1)

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and minerals are widely suggested by the Madurese, especially for pregnant women. More than half (57.4%) of pregnant women had food suggestions across their pregnancy. This result suggested alternative food consists of food sources of carbohydrates, proteins, vitamins, and minerals. Carbohydrates are a source of energy needed by the human body. These compounds are present in various types of foods, especially in staple foods. Some pregnant women were likely to choose corn rice (nasi jagung) or white rice or a combination of both as a source of carbohydrates daily.

The types of animal protein suggested for pregnant women (Table 3) were generally fish and sea fish including skipjack tuna, milkfish, dorang fish (black pomfret fish), tamburan fish (amoy croaker), snapper, dukduk fish (toothed ponyfish), northern red snapper, pomfret fish, mullet fish, mossot fish (Sphyraena barracuda) and also tilapia fish. Other types of animal protein were egg, liver, beef, and shrimp. Meanwhile, plant proteins that were suggested for pregnant women were tempeh and tofu. There were no significant differences in food suggested for women in their first trimester and the second or third trimester. There was a tendency that the community suggests more food for women in their third trimester than the previous ones.

Vitamins and minerals derived from vegetables and fruits need to be consumed daily by pregnant women. Vegetables that were suggested (Table 4) for the women during pregnancy in this region were moringa leaves, bean sprouts, spinach, and carrots. Not many vegetables were avoided by pregnant women. Almost all types of vegetables were suggested for pregnant women.

In general, all fruits were highly suggested for pregnant women (Table 5). Apple was the most recommended for respondents. Orange, banana, papaya, and grapes were unseasonal fruits that were also suggested for pregnant women. There was a tendency for communities to suggest more fruits for women in their third trimester than their first and second trimester.

Table 3. Suggested animal and plant protein for the pregnant women

Animal and Plant Protein	1st Trimester (n=37)	2nd Trimester (n=112)	3rd Trimester (n=133)	Total (n=282)
Fish	6 (16.2)	6 (5.4)	14 (10.5)	26 (9.2)
Sea fish	1 (2.7)	9 (8.0)	8 (6.0)	18 (6.4)
Skipjack tuna	3 (8.1)	4 (3.6)	8 (6.0)	15 (5.3)
Egg	1 (2.7)	3 (2.8)	5 (3.8)	9 (3.2)
Anchovy	0 (0.0)	0 (0.0)	6 (4.5)	6 (2.1)
Milkfish	3 (8.1)	1 (0.9)	0 (0.0)	4 (1.4)
Liver	0 (0.0)	0 (0.0)	4 (3.0)	4 (1.4)
Beef	0 (0.0)	2 (1.8)	1 (0.8)	3 (1.1)
Shrimp	1 (2.7)	1 (0.9)	1 (0.8)	3 (1.1)
Salted fish	0 (0.0)	0 (0.0)	2 (1.5)	2 (0.7)
Others	0 (0.0)	1 (0.9)	1 (0.8)	2 (0.7)
Tempeh	0 (0.0)	0 (0.0)	1 (0.8)	1 (0.4)
Tofu	0 (0.0)	0 (0.0)	1 (0.8)	1 (0.4)

Table 4. Suggested vegetables for the pregnant women

Vegetables	1st Trimester (n=37)	2nd Trimester (n=112)	3rd Trimester (n=133)	Total (n=282)
All vegetables	3 (8.1)	19 (17)	16 (12)	38 (13.5)
Spinach	4 (10.8)	8 (7.1)	12 (9)	24 (8.5)
Moringa leaves	3 (8.1)	6 (5.4)	12 (9)	21 (7.4)
Water spinach	4 (10.8)	4 (3.6)	7 (5.3)	15 (5.3)
Carrot	5 (13.5)	4 (3.6)	2 (1.5)	11 (3.9)
Cassava leaves	1 (2.7)	5 (4.5)	4 (3)	10 (3.5)
Cabbage	3 (8.1)	2 (1.8)	1 (0.8)	6 (2.1)
Mung beans	0 (0)	4 (3.6)	2 (1.5)	6 (2.1)
Chinese cabbage	1 (2.7)	1 (0.9)	3 (2.3)	5 (1.8)
Long bean	1 (2.7)	1 (0.9)	1 (0.8)	3 (1.1)
Sprouts	1 (2.7)	1 (0.9)	0 (0)	2 (0.7)
Others	0 (0)	2 (1.8)	1 (0.8)	3 (1.1)

Table 5. Suggested fruits for the pregnant women

Fruits	1st Trimester (n=37)	2nd Trimester (n=112)	3rd Trimester (n=133)	Total (n=282)
Apple	9 (24.3)	19 (17)	25 (18.8)	53 (18.8)
All fruits	3 (8.1)	9 (8)	12 (9)	24 (8.5)
Orange	4 (10.8)	4 (3.6)	8 (6)	16 (5.7)
Banana	4 (10.8)	4 (3.6)	7 (5.3)	15 (5.3)
Papaya	3 (8.1)	2 (1.8)	4 (3)	9 (3.2)
Grapes	1 (2.7)	1 (0.9)	3 (2.3)	5 (1.8)
Avocado	1 (2.7)	0 (0)	2 (1.5)	3 (1.1)
Pear	0 (0)	2 (1.8)	1 (0.8)	3 (1.1)
Lime	0 (0)	1 (0.9)	1 (0.8)	2 (0.7)
Dates	0 (0)	0 (0)	2 (1.5)	2 (0.7)
Others	0 (0)	2 (1.8)	4 (3.0)	6 (2.1)

During pregnancy, there were several types of drinks suggested for pregnant women (Table 6) such as mineral water, milk, coconut water, and jamu enggu. Coconut water and milk were the most suggested drinks for pregnant women (trimester 1-3). Pregnant women in the third trimester were also suggested to consume coconut water, milk, and mineral water. In addition, some people recommended pregnant women to consume vegetable oil or coconut oil and jamu enggu (a herbal drink) to facilitate the delivery process and for healthy babies. Madurese believe that only pregnant women in their third trimester consume jamu enggu because it could trigger contractions.

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Table 6. Suggested drinks for the pregnant women

Drinks	1st Trimester (n=37)	2nd Trimester (n=112)	3rd Trimester (n=133)	Total (n=282)
Coconut water	5 (13.5)	13 (11.6)	17 (12.8)	35 (12.4)
Milk	5 (13.5)	10 (8.9)	7 (5.3)	22 (7.8)
Lime juice	5 (13.5)	1 (0.9)	0 (0)	6 (2.1)
Mineral water	0 (0)	3 (2.7)	3 (2.3)	6 (2.1)
Vegetable oil and coconut oil	0 (0)	0 (0)	2 (1.5)	2 (0.7)
Jamu enggu*	0 (0)	0 (0)	1 (0.8)	1 (0.4)
Coffee	0 (0)	0 (0)	1 (0.8)	1 (0.4)

*Jamu enggu is herbal drink made from the sap of the enggu plant (Ruta angustifolia Pers.)

3.3. Dietary Diversity

MDD-W represented dietary diversity. More than half (56%) of the pregnant women had a diverse diet (Table 7). In either the first, second, or third trimester group, more than 50% of the pregnant women had consumed ≥5 food groups. There was a tendency that the higher trimester had a lower dietary diversity. Pregnant women in the third trimester had lower consumption of eggs and other vegetables compared to the first and second trimester.

There were many pregnant women (59.6%) who consumed low nutrient density food groups. The consumption of animal food such as meat, poultry, fish, and other kinds of seafood was relatively high (more than 75% of pregnant women consumed it) compared to the consumption of eggs (the number of pregnant women consuming egg was around 39.8%-51.4%). It seems that milk is the only source of animal food that was rarely consumed by pregnant women. In total, only 11.7% of pregnant women consumed milk (Table 7).

All pregnant women consumed grains, and most of them also ate pulses, particularly in the form of tempeh and tofu. One-third of pregnant women consumed nuts and seeds such as peanut in the form of peanut sauce. This peanut sauce was used in many traditional dishes (Table 7).

Low consumption of vegetables and fruits was found in this study. Half of pregnant women consumed vegetables and fruits. Dark green leafy vegetables were the most favourable for them. Meanwhile, other vegetables, other fruits, vitamin A-rich fruits and vegetables were only consumed by less than 35% pregnant women (Table 7).

3.4. Association of Meal Frequency and Food Suggestions with Dietary Diversity

Table 8 revealed that most pregnant women ate ≤3 times/day. This low meal frequency was found in both groups (diverse and non-diverse diet). Therefore, there was no significant association between meal frequency and dietary diversity of pregnant women (p=0.214). Table 8 shows that in a diverse diet group (≥5 groups), pregnant women had significantly higher food suggestions than non-diverse diet group. Therefore, pregnant women who have food suggestions had better dietary diversity (p=0.003).

4. Discussion

More than half of pregnant women had adequate dietary diversity with a mean of MDD-W score 4.8±1.4. These findings were higher than in other studies in Ethiopia (Desta et al., 2019; Yeneabat et al., 2019) but lower than Kenya (Kiboi et al., 2017). The risk of anaemia in pregnant women who consumed low dietary diversity is higher than pregnant women who have a high dietary diversity score (Delil et al., 2018). Pregnant women are recommended to consume a high diversity diet to aid in the physiological demand of the fetus and mother. Dietary diversity is important

Table 7. Distribution of pregnant women by dietary diversity [n (%)]

Variable	1st Trimester (n=37)	2nd Trimester (n=112)	3rd Trimester (n=133)	Total (n=282)
Percent achieving MDD-W				
- <5 food groups	13 (35.1)	49 (43.8)	62 (46.6)	124 (44.0)
- ≥5 food groups	24 (64.9)	63 (56.3)	71 (53.4)	158 (56.0)
- Mean±SD	4.9±1.4	4.9±1.6	4.7±1.5	4.8±1.4
Low nutrient density food groups (Sweets & Sweetened drinks)	22 (59.5)	64 (57.1)	82 (61.7)	168 (59.6)
Animal Food				
- Meat, poultry, fish and other seafood	31 (83.8)	85 (75.9)	109 (82.0)	225 (79.8)
- Eggs	19 (51.4)	51 (45.5)	53 (39.8)	123 (43.6)
- Milk and dairy products	10 (27)	12 (10.7)	11 (8.3)	33 (11.7)
Plant Food				
- Grains, white roots, and tubers, and plantains	37 (100)	112 (100)	133 (100)	282 (100)
- Pulses (beans, peas, and lentils)	23 (62.2)	75 (67.0)	95 (71.4)	193 (68.4)
- Nuts and seeds	13 (35.1)	36 (32.1)	44 (33.1)	93 (33)
Vegetables and fruits				
- Dark Green Leafy Vegetables	13 (35.1)	59 (52.7)	74 (55.6)	146 (51.8)
- Vitamin A-rich fruits and vegetables	11 (29.7)	37 (33)	35 (26.3)	83 (29.4)
- Other vegetables	14 (37.8)	42 (37.5)	38 (28.6)	94 (33.3)
- Other fruits	11 (29.7)	39 (34.8)	39 (29.3)	89 (31.6)

Table 8. Association of meal frequency and food suggestions with dietary diversity

Variables	Dietary Diversity		P value
	<5 groups	≥5 groups	
Meal frequency			
≤3 times/day	114 (91.9)	138 (87.3)	0.214
>3 times/day	10 (8.1)	20 (12.7)	
Food Suggestions			
Yes	59 (47.6)	103 (65.2)	0.003
No	65 (52.4)	55 (34.8)	

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because it can maintain and increase appetite. Dietary diversity is further influenced by the availability of food in nature, season, livelihood, household size, and gender (Powell et al., 2017).

Grains, white roots, tubers, and plantains were consumed by 100% of pregnant women. Madurese, like other Indonesians, consume starchy staples every day. Rice or corn rice (nasi jagung) were the staple food consumed 2-3 times a day. This study revealed no significant association between meal frequency with dietary diversity (p=0.214). Nonetheless, there was a tendency that pregnant women who ate more frequently had a higher dietary diversity. A study by Yeneabat et al. (2019) stated that increasing meal frequency improves pregnant women's dietary diversity.

Most of the pregnant women consumed meat and poultry, fish, and other seafood. For animal food, fish was the most frequently consumed, which is highly recommended for consumption because it is believed to strengthen children's cognitive development. Fish are abundant at the study site because most of them lived in coastal areas. Starling et al. (2015) stated that fish intake (one or more servings of fish per week) during pregnancy was associated with positive fetal neurodevelopmental (Starling et al., 2015). Another study by Gale et al. (2008) revealed that a higher frequency of fish consumption (<1/ week, 1-2/ week, and >3/ week) during late pregnancy was associated with a higher verbal Intelligence Quotient (IQ) among nine-year-old children born to mothers who consumed fish compared to those who did not.

More than half of pregnant women consumed pulses, particularly soybean and soybean products such as tempeh and tofu. At the same time, the consumption of nuts and seeds (particularly peanuts) was only found among 33.0% of pregnant women. Tofu and tempeh are very affordable so that they are widely consumed as a side dish. Additionally, some traditional mixed dishes also use tofu as a supplementary ingredient, such as "rujak" (traditional Madurese salad). Madurese "rujak" is made of compressed rice (lontong), boiled vegetables (bean sprout, water spinach), fruits (cucumber and jicama/ yam bean), and fried tofu with peanut sauce. Soybeans contain all of the essential amino acids necessary for human nutrition. However, when consumed alone, the protein quality is still below animal protein. Soybean has limited amounts of methionine. The chemical score of soybeans (47) is only half of that of an egg (100). Soybean has a lower protein efficiency ratio, biological value, and net protein utilisation than egg and fish (Brody, 1999). Therefore, soybean consumption should be combined with other plant-based proteins to complement the amino acid and to increase the protein quality. Soybeans are often recommended as a dietary substitution for higher-fat animal products because it is a complete source of protein, and it has lower cholesterol (Michelfelder, 2009).

Pregnant women in the first trimester had a more diverse diet than the second- and the third- trimester. This finding seems to be in contrast with the dietary quantity of pregnant women. Mothers in their first trimester eat less (amount and frequency) than in the 2nd trimester. Most pregnant women in trimester one have vomiting and nausea, which cause low appetite and low intake of nutrient (Bustos et al., 2017). Nonetheless, Table 7 shows that mothers in the first trimester consume more eggs, milk, and dairy products than the second- and the third- trimester.

On the contrary, consumption of low nutrient density food, pulses, and dark green leafy vegetables was higher in trimester 2 and 3 than trimester 1. Vomiting and nausea in the first trimester cause a low intake of nutrients in pregnant women. In their third trimester, more focus is placed on labour preparation and breastfeeding. Therefore, it is suggested that pregnant women consume more milk throughout the pregnancy so that nutritional requirements can be fulfilled. Pulses and dark green leafy vegetables are food sources of folate. Folate deficiency has been associated with anaemia during the pregnancy (Kominiarek & Rajan, 2016). Besides, pulses and dark green leafy vegetables are also believed to increase the production of breastmilk. Moringa leaf is a green vegetable that is widely recommended for pregnant women in Madura and easily found around their homes.

Consumption of animal protein could help the fulfilment of protein and micronutrients. The husband's support for the fulfilment of nutrient adequacy could be a key factor to avoid the low dietary quantity and diversity in the first trimester. This result is similar to studies from Bangladesh (Nguyen et al., 2017) and

Ethiopia (Desta et al., 2019) which stated that husband support is a determinant factor in dietary diversity.
In this study, more than half of pregnant women had a food suggestion from the community either in trimester 1 or trimester 2 and 3. There was a tendency that the community suggests more food for women in their third trimester than the previous ones. Tables 3-6 record that mothers in trimester 1 were more often suggested to eat fish, all kinds of vegetables (particularly spinach and moringa leaves), apple and all kinds of fruits, and milk compared to women in trimester 3. The contingency coefficient discovers that there was a significant association between food suggestions with dietary diversity (p=0.003). Pregnant women who received diet suggestions had a more diverse diet than those not having diet suggestions.

Consumption of various kinds of food should be emphasised and promoted to pregnant women. The Indonesian Dietary Guidelines also strongly recommend the importance of consuming a variety of foods needed to fulfil the nutritional needs (Ministry of Health, 2014). However, at a social level, the main problem in consuming a variety of food is the lack of purchasing power and availability of such variety in the market (Desta et al., 2019; Yeneabat et al., 2019).

5. Conclusion

Pregnant women need to follow food suggestions so they can have a proper and diverse diet. Indigenous knowledge, such as food suggestions from the community be it from family, relatives, elders, or health officers has a beneficial effect on a pregnant woman's diet. The husband could be a key person in increasing the food consumption of pregnant women in the first trimester. Women in the third trimester should increase animal protein and decrease the consumption of low nutrient density.

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7. Conflict of Interest

The authors declare that there was no conflict of interest. The funders had no role in the study design, the collection, analyses, and interpretation of data, the writing of the manuscript, or the decision to publish the results.

8. References

Asayehu, T. T., Lachat, C., Henauw, S. De, & Gebreyesus, S. H. (2017). Dietary behaviour, food and nutrient intake of women do not change during pregnancy in Southern Ethiopia. Maternal and Child Nutrition, 13(2), 1–10. https://doi.org/10.1111/mcn.12343

Bailey, R. L., Pac, S. G., Fulgoni, V. L., Reidy, K. C., & Catalano, P. M. (2019). Estimation of Total Usual Dietary Intakes of Pregnant Women in the United States. JAMA Network Open, 2(6). https://doi.org/10.1001/jamanetworkopen.2019.5967

Brody, T. (1999). Nutritional Biochemistry Second Edition. San Diego, California: Academic Press.

Bustos, M., Venkataramanan, R., Caritis, S., Pittsburgh, T. S., Sciences, R., Womens, M., & Sciences, R. (2017). Nausea and Vomiting of Pregnancy-What's New? Martha. HHS Public Access, 202, 62–72. https://doi.org/10.1016/j.autneu.2016.05.002.Nausea

Danielewicz, H., Myszczyszyn, G., Dębińska, A., Myszkal, A., Boznański, A., & Hirnle, L. (2017). Diet in pregnancy—more than food. European Journal of Pediatrics, 176(12), 1573–1579. https://doi.org/10.1007/s00431-017-3026-5

Delil, R., Tamiru, D., & Zinab, B. (2018). Dietary Diversity and Its Association with Anemia among Pregnant Women Attending Public Health Facilities in South Ethiopia. Ethiop J Health Sci, 28(5), 625–634.

Desta, M., Akibu, M., Tadese, M., & Tesfaye, M. (2019). Dietary Diversity and Associated Factors among Pregnant Women Attending Antenatal Clinic in Shashemane, Oromia, Central Ethiopia: A Cross-Sectional Study. Journal of Nutrition and Metabolism, 2019, 7–10. https://doi.org/10.1155/2019/3916864

Diana, R., Rachmayanti, R. D., Anwar, F., Khomsan, A., Christianti, D. F., & Kusuma, R. (2018). Food taboos and suggestions among Madurese pregnant women: a qualitative study. Journal of Ethnic Foods, 5(4). https://doi.org/10.1016/j.jef.2018.10.006

ISSN-Internet 2197-411x OLCL 862804632

Dubois, L., Diasparra, M., Bedard, B., Colapinto, C. K., Fontaine-Bisson, B., Morisset, A. S., … & Fraser, W. D. (2017). Adequacy of nutritional intake from food and supplements in a cohort of pregnant women in Québec, Canada: The 3D Cohort Study (Design, Develop, Discover). American Journal of Clinical Nutrition, 106(2), 541–548. https://doi.org/10.3945/ajcn.117.155499

FAO and FHI 360. (2016). Minimum Dietary Diversity for Women- A Guide to Measurement. Rome: FAO. Retrieved from http://www.fao.org/3/a-i5486e.pdf

Gale, C. R., Robinson, S. M., Godfrey, K. M., Law, C. M., Schlotz, W., & Callaghan, F. J. O. (2008). Oily fish intake during pregnancy – association with lower hyperactivity but not with higher full-scale IQ in offspring. Journal of Child Psychology and Psychiatry, 49(10), 1061–1068. https://doi.org/10.1111/j.1469-7610.2008.01908.x

Kiboi, W., Kimiywe, J., & Chege, P. (2017). Determinants of dietary diversity among pregnant women in Laikipia County, Kenya: a cross-sectional study. BMC Nutrition, 3(1), 1–8. https://doi.org/10.1186/s40795-017-0126-6

Kominiarek, M. A., & Rajan, P. (2016). Nutrition Recommendations in Pregnancy and Lactation. Med Clin North Am, 100(6), 1199–1215. https://doi.org/10.1016/j.mcna.2016.06.004.Nutrition

Madanijah, S., Briawan, D., Rimbawan, R., Zulaikhah, Z., Andarwulan, N., Nuraida, L., … & Bindels, J. (2016). Nutritional status of pre-pregnant and pregnant women residing in Bogor district, Indonesia: a cross-sectional dietary and nutrient intake study. British Journal of Nutrition, 116(Supplement S1), S57–S66. https://doi.org/10.1017/S000711451600057X

Michelfelder, A. J. (2009). Soy: A Complete Source of Protein. American Family Physician, 79(1), 43–47.

Ministry of Health. (2014). Balanced Diet Guidelines. Jakarta: Ministry of Health.

Ministry of Health. (2019). Basic Health Survey 2018. Jakarta: Ministry of Health.

Murakami, K., & Livingstone, M. B. E. (2016). Associations between Meal and Snack Frequency and Diet Quality in US Adults: National Health and Nutrition Examination Survey 2003-2012. Journal of the Academy of Nutrition and Dietetics, 116(7), 1101–1113. https://doi.org/10.1016/j.jand.2015.12.012

Nag, M. (1994). Beliefs and Practices about Food during Pregnancy: Implications for Maternal Nutrition. Economic And Political Weekly, 29(37), 2427–2438. https://doi.org/10.2307/4401755

Nguyen, C. L., Van Hoang, D., Nguyen, P. T. H., Van Ha, A. V., Chu, T. K., Pham, N. M., … & Binns, C. W. (2018). Low dietary intakes of essential nutrients during pregnancy in Vietnam. Nutrients, 10(8), 1–13. https://doi.org/10.3390/nu10081025

Nguyen, P. H., Sanghvi, T., Kim, S. S., Tran, L. M., Afsana, K., Mahmud, Z., … & Menon, P. (2017). Factors influencing maternal nutrition practices in a large scale maternal, newborn and child health program in Bangladesh. PLoS ONE, 12(7), 1–17. https://doi.org/10.1371/journal.pone.0179873

Powell, B., Kerr, R. B., Young, S. L., & Johns, T. (2017). The determinants of dietary diversity and nutrition : ethnonutrition knowledge of local people in the East Usambara Mountains, Tanzania. Journal of Ethnobiology and Ethnomedicine, 13(23), 1–12. https://doi.org/10.1186/s13002-017-0150-2

Rathnayake, K. M., Madushani, P., & Silva, K. (2012). Use of dietary diversity score as a proxy indicator of nutrient adequacy of rural elderly people in Sri Lanka. BMC Research Notes, 5, 2–7. https://doi.org/10.1186/1756-0500-5-469

Starling, P., Charlton, K., Mcmahon, A. T., & Lucas, C. (2015). Fish Intake during Pregnancy and Fetal Neurodevelopment-A Systematic Review of the Evidence. Nutrients, 7, 2001–2014. https://doi.org/10.3390/nu7032001

Yeneabat, T., Adugna, H., Asmamaw, T., Wubetu, M., Admas, M., Hailu, G., … Amare, T. (2019). Maternal dietary diversity and micronutrient adequacy during pregnancy and related factors in East Gojjam Zone, Northwest Ethiopia, 2016. BMC Pregnancy and Childbirth, 19(1), 1–9. https://doi.org/10.1186/s12884-019-2299-2

Zeng, Z., Liu, F., & Li, S. (2017). Metabolic Adaptations in Pregnancy: A Review. Annals of Nutrition and Metabolism, 70(1), 59–65. https://doi.org/10.1159/000459633

ISSN-Internet 2197-411x OLCL 862804632