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Research Article
Dietary Quality and Nutritional Status of Pregnant Women in Sumenep Regency, Madura, Indonesia

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Abstract

Background and Objective: It is important for pregnant women to have a good quality diet since it affects their nutritional status and that of the fetus. The present study analyzed the correlation between dietary quality and nutritional status of pregnant women in Sumenep Regency, Madura Island, Indonesia. **Methodology:** The present cross-sectional study assessed the nutritional status and the dietary quality of 145 pregnant women aged 18-49 years living in Sumenep Regency. The nutritional status was analyzed based on Gestational Weight Gain (GWG). Alternate Healthy Eating Index for Pregnancy (AHEI-P) and Indonesian-adapted AHEI-P was used to analyze the dietary quality. A validity test was conducted on both AHEI-Ps by analyzing the Pearson correlation coefficient. Pearson analysis was also used to analyze correlations between dietary quality and GWG. **Results:** The result showed 62.15% of subjects had inadequate Gestational Weight Gain (GWG). Validity testing of the adapted AHEI-P showed a higher validity score compared to the unadapted version (0.804 versus 0.783). According to both AHEI-P analyses, the dietary quality of most subjects needed improvement. Subjects whose GWGs were inadequate had the lowest mean score for both AHEI-Ps but no significant correlation ($p>0.05$) was found between GWG and either AHEI-P. **Conclusion:** Overall, subjects needed to improve their dietary quality. Although AHEI-P scores increased with improvements in GWG, no significant correlations were found.

Key words: Alternate healthy eating index for pregnancy, dietary quality, gestational weight gain, nutritional status, pregnant women

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The high prevalence of malnutrition in pregnant women can still be found in developing countries, like Indonesia. According to the Ministry of Health[1], 24.2% of pregnant women in Indonesia were at risk of suffering from Chronic Energy Deficiency (CED), with 37.1% being anemic and 24.3% deficient in iodine. This situation warrants special attention since nutrition plays an important role during pregnancy. Poor nutritional status during pregnancy can lead to preterm pregnancy, low birth weight and other adverse outcomes[2,3]. Diet plays a major role in determining the nutritional status of pregnant women. Quantitatively, pregnant women who consume sufficient amounts of food tend to have a good nutritional status and also tend to deliver healthier babies[4,5]. Nonetheless, it is also important for pregnant women to consider the quality of their diet[6]. While quantity focuses on how much food is consumed, quality focuses on how diverse and nutritionally balanced the food is. Therefore, dietary quality often better reflects whether or not the diet is good. Previous studies had showed that the quality of a diet was as important as its quantity. The study found that poor dietary quality would lead to poor nutritional status[7]. Furthermore, one study showed that the risk of malnutrition in pregnant women decreased by 53% when their dietary quality was improved[8].

Unfortunately, most pregnant women in Indonesia still tend to only focus on the quantity of food consumed in their diet, without regard for the quality[9]. Moreover, there is still a lack of studies focused on the dietary quality of pregnant women in Indonesia. Therefore, the current study focused on analyzing the relationship between dietary quality and nutritional status in pregnant women especially in Sumenep Regency, Madura Island, Indonesia. This study was also the first study to analyze dietary quality of pregnant women in Indonesia using AHEI-P and the first to adapt the AHEI-P based on Indonesian dietary guidelines.

MATERIALS AND METHODS

The current cross-sectional study was conducted on a total of 145 pregnant women aged 18-49 years residing near Lenteng, Moncek, Kalianget and Batang–Batang community health centers; these centers had the highest prevalence of CED in Sumenep Regency from March-April, 2017. Subjects free from specific diets, health complications and multiple pregnancies were included in the study. The present investigation was also part of major study entitled Dietary Intake, Nutritional Status, Traditional Beliefs and Practices of Pregnant Women in Madura Island funded by the Neys-van Hoogstraten Foundation and approved by the Ethical Committee of the Faculty of Public Health, Airlangga University, Surabaya, Indonesia (No. 1-KEPK).

Anthropometric measurements: Body weight was measured to the nearest 0.1 kg using a *Camry EB9003* digital scale manufactured by Zhongshan (Baishawan Industry Park, Qiwan Road E, Zhongshan, Guangdong, China) and height was measured to the nearest 0.1 cm using a microtoise stature meter . Pre-pregnancy body weight was obtained from health records available from the community health centers. Gestational Weight Gain (GWG) based on pre-pregnancy nutritional status as recommended by the Institute of Medicine (IOM) was used as the nutritional status indicator in the present study[10].

Dietary quality: Dietary quality data were obtained by Semi-Quantitative Food Frequency Questionnaire and the Alternate Healthy Eating Index for Pregnancy (AHEI-P) was used to analyze the dietary quality of the subjects[11]. AHEI-P consisted of 9 indicators. Each indicator had maximum score of 10, so that the total scores would be 90. An adaptation of the AHEI-P fit Indonesian dietary guidelines was also used for comparison. In the adapted AHEI-P, maximum score criteria for fiber and iron were adjusted to 30 and 37 g/day, respectively. Two indicators (energy and protein) were also added to represent the high prevalence of CED in Indonesia with a maximum score of $\geq$2500 kcal/day for energy and $\geq$77 g/day for protein; 0 and $\geq$2700 kcal/day were used as minimum scores for energy. For minimum score of energy 0 kcal/day meant that no energy was consumed, $\geq$2700 kcal/day were also used as minimum score to represent that consuming excess energy was also problematic because it would lead to overweight and obesity. The adapted AHEI-P had a total score of 110. Intermediate adapted AHEI-P scores were calculated according to the method described by AHEI-P[11]. Both AHEI-Ps were classified based on Basiotis *et al.*[12] and the following cut-off points were established for each: Poor quality (unadapted, <45; adapted, <55), needs improvement (unadapted, 45-72; adapted, 55-88) and high quality (unadapted, >72; adapted, >88). Both AHEI-Ps were validated by comparing them to the Mean Adequate Ratio (MAR).

Data analysis: The data were analyzed using IBM SPSS software version 23 (IBM Corp., Armonk, New York, United States of America). A validity test was conducted on both AHEI-Ps by analyzing the Pearson coefficient correlation. Pearson analysis was also used to analyze correlations between dietary quality and GWG.

Table 1: Score comparison between unadapted and Adapated AHEI-P

	Mean±SD	
Components	AHEI-P	Adapted AHEI-P
Vegetables	0.7±0.6	0.7±0.6
Fruit	2.9±2.5	2.9±2.5
White to red meat ratio	9.9±0.8	9.9±0.8
Fiber	7.3±2.3	5.8±2.2
Trans fat (% energy)	1.2±1.3	1.2±1.3
Unsaturated to saturated fat ratio	8.8±2.1	8.8±2.1
Calcium	6.0±3.1	6.0±3.1
Folate	4.6±2.0	4.6±2.0
Iron	4.9±2.5	3.7±2.0
Energy		5.9±2.8
Protein total score		9.4±1.4
	46.4±9.2	58.9±10.2
p-value	0.000[P]	0.000[P]
r	0.783	0.804

[P]Pearson correlation significant at 0.01 level

Table 2: Subjects distribution by quality of diet

Category	Number	Pecentage
AHEI-P		
Poor (<45)	72	49.7
Need improvements (45-72)	73	50.3
High (>72)	0	0.0
AHEI-P adaptasi		
Poor (<55)	52	35.9
Need improvements (55-88)	93	64.1
High (>88)	0	0.0

Table 3: Mean score of dietary quality based on nutrition status

	Mean±SD	
GWG rate	AHEI-P	Adapted AHEI-P
Inadequate	45±8	58±8
Adequate	46±9	59±11
Excessive	47±4	60±11

RESULTS

The present study was conducted on 145 pregnant women residing near one of four community health centers in Sumenep Regency. The GWG was used to determine the nutritional status of the subjects. The result showed that 90 subjects had an inadequate GWG, 32 had an adequate GWG and 23 had excessive GWGs.

Mean total AHEI-P and adapted AHEI-P scores were 46.4±9.2 and 58.9±10.2, respectively; thus, both assessments classified subjects as needing improvement. Consumption of vegetables had the lowest mean score (0.7±0.6), while the ratio of white to red meat had the highest (9.9±0.8) in both AHEI-Ps. Table 1 shows Pearson correlation coefficients between the mean adequate ratio and AHEI-P (0.783) and adapted AHEI-P, (0.804).

The result also showed that the dietary quality of 72 subjects was classified as poor and that of 73 subjects was classified as needs improvement by the AHEI-P. Based on the adapted AHEI-P, the dietary quality of 52 subjects was classified as poor and that of 93 subjects was classified as needs improvement. None of the subjects had a high quality diet based on either AHEI-P analysis (Table 2). Mean scores for all GWG categories on both AHEI-Ps were in the needs improvement score range (Table 3), with a mean score between 45 and 47 for the AHEI-P and 58-60 for the adapted AHEI-P. Nonetheless, the results showed that there was not a significant correlation between dietary quality and GWG rate.

DISCUSSION

The majority of subjects in the present study were found to have inadequate GWG. This result is consistent with the findings of the Ministry of Health[1] who reported that there is still a high prevalence of malnutrition in Indonesia. This result is also consistent with the public health situation in Sumenep Regency. The CED is still found to be problematic since its prevalence tends to fluctuate. In 2014, the number of CED cases in Sumenep Regency decreased by about 50%. However, this region failed to maintain their success through 2015 as the prevalence of CED increased by 60%[13].

Present results showed that vegetable consumption scored lowest in both AHEI-P analyses, meaning subjects consumed inadequate amounts. This finding is consistent with a previous study wherein the majority of pregnant Indonesian women always included vegetables in their diet but in amounts below recommendations[14]. Moreover, current results showed that the ratio of white to red meat had the highest mean score, indicating consumption of red meat was low. The Semi-Quantitative Food Frequency Questionnaire also showed that subjects only consumed red meat once or twice a year. This finding is common in rural areas of Indonesia as majority of the subjects consume red meat only on religious or special occasions[15].

Adaptations of the AHEI-P have been used in several countries, such as Singapore, Brazil and Spain. Adaptations were created by modifying criterion and adding or excluding indicators based on the dietary guidelines and food patterns of each country[16-18]. In the present study, an Indonesian-adapted AHEI-P was used and a validity test was carried out on both AHEI-Ps used. The results showed that both AHEI-Ps had high Pearson coefficient of correlations, though that of the adapted AHEI-P was higher. This means that the adapted AHEI-P had better validity or was able to analyze the dietary quality more precisely than the unadapted version. In addition, none of the subjects were found to have high dietary quality and the majority had a dietary quality classified as

needs improvement by both AHEI-P analyses. A previous study also showed similar findings; a low score was found in area-level analysis of pregnant woman dietary quality using desirable dietary pattern scores (58.2 out of 100)[9].

Furthermore, mean unadapted and adapted AHEI-P scores in all GWG categories were classified as needs improvement. This result was due to the majority of subjects being classified in the needs improvement category for their dietary quality distribution. Moreover, subjects who had inadequate GWGs had the lowest unadapted and adapted AHEI-P scores. Dietary quality is associated with nutrient intake; it is hard to attain an adequate GWG when nutrient intake is low[19]. Nevertheless, there were no significant correlations found between either AHEI-P and GWG. It is always challenging to examine dietary quality, especially of pregnant women, in developing countries. It is also challenging because nutritional status is not merely determined by a single factor, further analysis of other factors is needed[20].

The present study implies that the dietary quality of pregnant women especially in rural area of Indonesia is still problematic and needs to be improved. Supports from government and other related sectors are needed to solve this matter. Finding of this study is still preliminary but it showed that adapted AHEI-P is applicable. It can be an alternative instrument to assess the dietary quality of pregnant women although further improvement and analysis needed. Present study has some limitations. First, the trans fat data is not provided in Indonesian Food Composition Table. In order to attain the trans fat data we must borrow Food Composition Table from other countries. Second, the present study was conducted only in rural area, assessment on urban area is needed to justify whether the adapted instrument is also applicable to be used in both areas.

CONCLUSION

All subjects needed to improve the quality of their diet. Although there was no correlation between nutritional status and dietary quality via AHEI-P, more effort to raise awareness of the importance of dietary quality for pregnant women is needed. In addition, further analysis on how dietary quality affects pregnancy outcomes is also needed.

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SIGNIFICANCE STATEMENT

This study was the first attempt to analyze dietary quality of pregnant women in Indonesia using AHEI-P and the first to adapt the AHEI-P based on Indonesian dietary guidelines. This study found that adapted AHEI-P had better validity score. This study also found that the subjects need to improve their diet. Although no significant correlation was on found between GWG rate and dietary quality, subjects with inadequate GWG rate had the lowest AHEI-P mean score. The findings provide significant insight into the importance of dietary quality among pregnant women and provide introduction to another instrument for analyzing dietary quality of pregnant women.

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