Fish, Meat, Vegetable Food Expenditures are Contribute to Haemoglobin Concentration among Pregnant Women in Sub-Urban Areas of Indonesia

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Abstract: Low haemoglobin concentration during pregnancy remains a problem in developing countries. One of contributing factors towards haemoglobin concentration is food intake to do with protein and high iron sources. The intake of this type of food is affected by economy access that can be measured by food expenditure. The objective of this research was to analyse the correlation of food expenditure and haemoglobin concentration among pregnant women in sub-urban areas. A cross-sectional study was conducted from August-October 2016 in Sidoarjo, East Java. The sample was selected by stratified random sampling. The sample was 83 pregnant women who completed a blood sample collection and home visit interview. The characteristics and food expenditure were assessed by way of a structured questionnaire. The haemoglobin concentration was analysed by the cyan meth method. The Pearson correlation was employed to analyse the data. The result showed that most of the pregnant women had graduated from high school, were on their second pregnancy, and the majority were housewives. The mean of the haemoglobin concentration was 14.5 (SD±0.958). There was a correlation of total food expenditure, and fish, meat and vegetable expenditure towards haemoglobin concentration in pregnant women. It can be concluded that the higher the proportion of expenditure on fish, meat and vegetables, the more it contributes to a higher haemoglobin concentration.

1 INTRODUCTION

The problem of low haemoglobin level in pregnant women is ubiquitous in developing countries due to the changes in the physiology during pregnancy and the low intake of iron source food. Low haemoglobin level in pregnancy poses a higher risk of foetal and neonatal morbidity as well prematurity and low birth weight. Low haemoglobin level below the cut off is depicted by anaemia. Based on an Indonesia basic health survey in 2013, it indicated that the proportion of anaemia in pregnant women was 37.1%. The figure of anaemia in rural area was slightly higher than that in urban areas, accounting for 37.8%. The urban area proportion was 36.4% (Balitbangkes RI, 2013). The Indonesian government set up the target that anaemia among pregnant women should be below 30%. Therefore, anaemia remains a problem in pregnant women.

The cause of anaemia is due to multiple factors. Among those factors are nutritional such as vitamin and mineral deficiencies and non-nutritional such as infection and haemoglobinopathies. The major mineral deficiency linked to anaemia is iron, since it has a role in oxygen transport and there is often a low availability of iron source in daily consumption, hence it is considered that iron deficiency is one of the ten leading global risk factors of disease burden (McLean et al., 2007).

Pregnant women in developing countries are prone to having the higher risk of nutritional problems due to several factors such as socio economy, inadequate diet, the high burden of physical demand due to household chores and frequent reproductive cycles (Lee et al., 2013). Moreover, women in low-income households are more likely to eat a poor diet than their wealthier counterparts due in part to an inadequate understanding of nutritional requirements and the limited ability to purchase healthy foods (Bhargava, 2004).

Based on previous research, it showed that consumer motivations to purchase foods are mainly influenced by the price of food, and also its taste and convenience (Lennernas et al., 1997). Moreover, for lower income families, price is the most important and the decision made is based on the ability to purchase the food item (Dachner et al., 2010).

Therefore, a family with a low income often perceive that a healthier diet such as a decent intake of meat, vegetable, fruits and dairy product is difficult to obtain.

Individual or family food access can be linked to their health outcomes. The lack of family access to healthy food is also known as household food insecurity. A study in Bangladesh, a developing country with similar social background to Indonesia showed that food insecurity in the household reduced maternal dietary diversity, particularly with a reduction in all types of animal source foods such as eggs, meat, fish and dairy products (Na et al., 2016).

Identifying the link between particular food expenditure and the haemoglobin level in pregnant women may suggest an important intervention due at the household level. The purpose of this study was test the hypothesis as to whether total food expenditure and expenditure on particular items are inversely related to the level of haemoglobin among pregnant women in sub-urban areas.

2 METHODS

2.1 Study design and setting

The cross-sectional survey study was conducted from August -October 2016. The study was conducted in an area with a high prevalence of anaemia and chronic energy deficiency (CED) among pregnant women in Sidoarjo, East Java. Sidoarjo is sub urban area that is located near the capital city of East Java Province.

2.2 Study participants

The study participants were 83 eligible pregnant women who were randomly selected for the sample. Stratified random sampling was done by looking at the primary health care (PHC) centres with a high prevalence of anaemia and CED, and dividing them into three (3) stratum based on the village characteristics. The sample size calculation found 21 PHC: 8 PHC in the urban area, 7 PHC in rural areas and 6 PHC in industry areas. In each PHC, one village was selected randomly. In each village, five (5) pregnant women were selected randomly based on the midwives' register. Some pregnant women did not complete the blood test for various reasons. Therefore only 83 pregnant women's data has been possible to analyse in this research.

2.3 Measurements

The main outcome variable in this study was haemoglobin level. The independent variables include maternal characteristics, family income, food expenditure, child sex, prematurity, family type, maternal working status and maternal education. The data collection instrument was a validated structured questionnaire. Haemoglobin Assessment at the time of enrolment, 5 mL of venous blood was collected by a trained technician using standard procedures. The haemoglobin concentration was determined by the cyan-meth method.

2.4 Data collection and analysis

The data was collected by trained study enumerators during a home visit along with a face-to-face interview. The enumerators were trained by the research team and they did the trial interviews using a standardised questionnaire in two of the pregnant women before data collection in the research site. Descriptive statistics included the frequencies and proportions that were first performed. Following this, a bivariate analysis was done by way of the Spearman Correlation. A statistical association was declared to be significant if the p-value was less than 0.05.

2.5 Ethical consideration

Ethical clearance was obtained from the Faculty of Public Health of the Universitas Airlangga's Ethical Review Board with certificate number 504-KEPK. Written informed consent was also obtained from each respondent.

3 RESULTS

The results of this research showed that the maternal characteristics of the majority of pregnant women was that they had graduated from high school, were non-employed and on their second pregnancy. The detailed figure of the characteristics has been summarised in Table 1. 1. Demography profile.

Table 1: Distribution of the percentage of participants

Background Characteristics	n	%
Education level		
Elementary School	5	6.0
Junior high School	19	22.9
Senior high school	46	55.4
Diploma/University	13	15.7

Background Characteristics	n	%
Employment		
Had employment	19	22.9
Non-employment	64	77.1
Pregnancy		
First (1st)	25	30,1
Second (2nd)	43	51.8
≥ Third (3rd)	15	18.1

Drawn from several items of food expenditure, the food expenditure items were then correlated to haemoglobin concentration including fish, meat, vegetable and pulse (nut/lentil) expenditures. The detailed median of each food item and statistical correlation is in Table 2.

Table 2: the Median of Each Expenditure and Statistically Correlation

Food Expenditure Item per month	Mean±SD	p-value
Grain	205,000±105,470.41	0.309
Root/Tubers	10,000±42,112.79	0.115
Fish	120,000±131,969.81	0.000*
Meat	100,000±120,319.47	0.000*
Eggs and milk	80,000±236,058.19	0.477
Vegetable	80,000±62,317.37	0.016*
Pulse (nut, lentil)	80,000±47,837.64	0.523
Fruit	60,000±74,170.93	0.120
Instant noodle and crackers	25,000±50,783.25	0.381

*statistically significant correlation

The higher proportion of food expenditure was grain as the staple food. The mean of haemoglobin concentration among pregnant women was 14.5 (±0.958). This haemoglobin concentration is relative high.

4 DISCUSSION

Food prices pose a barrier to adopting a healthy diet. This research findings show that certain food expenditures, particularly fish, meat and vegetable expenditures, were correlated to haemoglobin level. Thus food which has a correlation to haemoglobin level is well known as a source of iron. However, sometimes the decisions to do with healthy food are often affected by the price of the food. This study is consistent with the previous finding that maternal dietary diversity declines in relation to the level of household insecurity which reported that animal source food, especially meat, fish, dairy product was consumed less by the pregnant women. There was also a lower frequency of micronutrient-dense plant-based food such as legumes and nuts (Na et al., 2016).

From this research findings, it should be also highlighted the contribution of food expenditure on vegetable to haemoglobin level of pregnant women. Since vegetable is considerable affordable for food insecure family, it is also important to encourage the pregnant women to include vegetable particularly dark green vegetable in their daily consumption.

The average of haemoglobin concentration in this research was at a good level. This reflects that the iron status among pregnant women is adequate. Iron plays a vital role in oxygen transportation and storage, oxidative metabolism, cellular proliferation and many other physiological processes. Dietary iron requirements are the highest in the second and third trimester of pregnancy (Lynch, 2007). The importance of maternal iron sufficiency is for ensuring an optimum supply for the developing foetus.

Findings from this study should be viewed with caution for several reasons. Although the food expenditure is significant correlated to haemoglobin concentration, it is not causal because of the nature of the study design that was employed. This study could not establish the causal effect. The expenditure itself was not calculated based on an individual basis, but instead on overall household expenditure. This may not represent the pregnant women's food consumption since it is also depends on the food distribution within the family.

5 CONCLUSION

The higher proportion of expenditure on fish, meat and vegetables contributes to a higher haemoglobin concentration. It has been suggested to the family to improve the quality of their diet by increasing the food expenditure in relation to iron-rich food.

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