

Factors affecting the incidence of chronic energy deficiency (CED) in pregnant women

Oon Fatonah Akbarini¹, Tessa Siswina²

^{1,2}Department of Obstetrics, Health Polytechnic Ministry of Health Pontianak, Pontianak, Indonesia

ARTICLE INFO

Article history:

Received Oct 19, 2022

Revised Oct 31, 2022

Accepted Nov 22, 2022

Keywords:

Pregnancy Distance

Opinion

Chronic Energy Conditions

(SEZ)

ABSTRACT

The purpose of this study was to analyze the factors that influence the incidence of chronic energy deficiency (CED) in pregnant women in the working area of the UPTD Puskesmas Kampung Bangka, Pontianak City. This type of research is cross sectional study design. with a purposive sampling approach. The results of this study show the results of the analysis of the relationship between parity, pregnancy distance, education, occupation and income that affect the incidence of chronic energy deficiency (CED) in pregnant women, namely parity of pregnant women with CED as many as 14 people (36.8%), distance 9 pregnant women with SEZ with high risk (56%), low education of pregnant women with SEZ as many as 10 people (45.5%), CED pregnant women with no work as many as 12 people (40%), and low income pregnant women with SEZ as many as 14 people (44%). Based on the results of the Chi Square test, the value of $p = 0.000 < (0.05)$ on the variable distance between pregnancy and income shows a significant relationship that affects the incidence of chronic energy deficiency (CED) in pregnant women while the parity, education and occupation variables show no there is a significant relationship that affects the incidence of chronic energy deficiency (CED) in pregnant women. The distance between pregnancy and income shows a significant relationship that affects the incidence of chronic energy deficiency (CED) in pregnant women.

This is an open access article under the [CC BY-NC](#) license.



Corresponding Author:

Oon Fatona Akbarini,
Department of Obstetrics,
Health Polytechnic Ministry of Health Pontianak,
Jl. October 28 Siantan Hulu Pontianak, Pontianak, Indonesia
Email: fatonah78@gmail.com

INTRODUCTION

The World Health Organization (WHO) reports that the prevalence of anemia and CED in global pregnancy is 35-75%, which is significantly higher in the third trimester compared to the first and second trimesters of pregnancy. WHO also noted that 40% of maternal deaths in developing countries are related to the highest prevalence of these cases due to Chronic Energy Deficiency which can lead to reduced nutritional status (Rukiah, 2010).

Chronic Energy Deficiency is a condition in which a person's nutritional status is not good, this is due to a lack of food consumption and energy sources containing nutrients. The nutritional

needs of pregnant women increase compared to before pregnancy which if the needs are not met, it can lead to malnutrition or Chronic Energy Deficiency Conditions (CED).

According to research by Palimbo (2014) which states about the relationship between knowledge and attitudes of pregnant women towards the incidence of CED, it can be seen that the incidence of CED is still quite high, namely as much as 74.2%, also according to AUSA's research (2013) with the title of research on the relationship between diet and economic status with the incidence of CED in pregnant women in Gowa district and it is known that there is a relationship between diet, energy intake of pregnant women, economic status with the incidence of SEZ and there is a relationship between economy and the incidence of SEZ.

An initial survey conducted by 10 pregnant women at the Kampung Dalam Puskesmas in Pontianak City, based on LILA measurements, it was found that 4 people (40%) of them had SEZ. Based on the results of interviews, pregnant women stated that they did not know about the importance of the LILA size in their pregnancy, besides that pregnant women did not consume a variety of foods, due to lack of appetite and inadequate economy. Based on the above phenomena, researchers are interested in conducting research on the factors that influence the incidence of chronic energy deficiency (CED) in pregnant women at the Kampung Bangka Health Center, Pontianak City.

Based on data from the Indonesian Ministry of Health (2018), where as many as 38.5% of pregnancies were of childbearing age with a risk of chronic energy deficiency (CED). The quality of food consumption during pregnancy is an important aspect for achieving the health status of the mother and the health of the baby later. So that a healthy mother and her intake can be fulfilled optimally during her pregnancy. This is inseparable from the influence of social, economic, cultural aspects, food consumption and its relation to the nutritional status of pregnant women. Problems related to the social, economic, and quality aspects of food consumption and their relation to the nutrition of pregnant women are as follows: What are the factors that influence the incidence of chronic energy deficiency (CED) in pregnant women at the Kampung Bangka Health Center, Pontianak City?. The purpose of this study was to analyze the factors that influence the incidence of chronic energy deficiency (CED) in pregnant women.

RESEARCH METHOD

This type of research is an analytical survey method using a cross-sectional approach. This research will be conducted in March–November 2021. This research will be carried out at the UPTD Puskesmas Kampung Bangka, Pontianak City. The independent variables in this study include socioeconomic, birth distance and parity. The dependent variable of this research is Chronic Energy Deficiency (CED).

The population in this study were all pregnant women aged 18-49 years who were in the working area of the UPTD Puskesmas Kampung Bangka. Mothers aged 18-49 years with the status of being pregnant and willing to participate in this study. By not having a history of genetic disease and being not sick, having a husband (married), and residing in the work area of the UPTD Puskesmas Kampung Bangka. The number of samples taken is based on a minimum sample of 40 pregnant women. The sampling technique used was the purposive sampling technique. The data collection instrument used was in the form of a list of questions or questionnaires consisting of closed questions given to respondents to fill in the respondent's characteristics, SEZ, parity, birth distance, economic status in the form of education, occupation and income.

The data of this research are primary data (direct interviews using questionnaires). Secondary data in the form of name, age, weight before pregnancy, home address. As for the primary data obtained by doing anthropometric measurements and then the data collected is data on economic characteristics, occupation, education level, parity and birth spacing. The analysis in this study was univariate and bivariate analysis.

RESULTS AND DISCUSSIONS

Result

Univariate Analysis

Table 1 . Frequency distribution of respondents based on parity , pregnancy distance, education, occupation and income

Characteristics of Respondents	Amount	
	N	%
Parity		
Low	38	95 %
Tall	2	5 %
Pregnancy Distance		
Low risk _	24	60 %
High risk _	16	40 %
Education _		
Higher education	18	45 %
Low education	22	55 %
Job _		
Doesn't work	30	75 %
Working	10	25 %
Income		
Low income	32	80 %
High income	8	20 %
Nutritional status		
No CED	26	65 %
CED	14	35 %

The results of the univariate analysis in Table 1 can be seen that of the 40 pregnant women respondents (95 %) with low parity , as many as 24 people (60 %) with low - risk pregnancy intervals, as many as 22 people (55 %) with low education , as many as 30 people (75 %) do not work, as many as 32 people (8 0 %) pregnant women with low income and as many as 26 people (65 %) pregnant women with nutritional status not SEZ.

Bivariate Analysis

Table 2. Analysis of the relationship between p arity , pregnancy distance, education, employment, income affecting the incidence of Chronic Energy Deficiency (CED) in pregnant women

Risk factor	Pregnant Women Nutritional Status				Amount		P - Value
	No CED		CED				
	(N)	(%)	(N)	(%)	(N)	(%)	
parity							
Low	24	63.2 %	14	36.8 %	38	100%	0.287 _
Tall	2	100 %	0	0%	2	100%	
Pregnancy Distance							
Low risk _	19	79 %	5	21%	24	100%	0, 0 2 1
High risk _	7	44 %	9	56 %	16	100%	
education _							
Higher education	14	77.8 %	4	22.2 %	18	100%	0.125 _
Low education	12	54.5 %	10	45.5 %	22	100%	
job _							
Doesn't work	18	60 %	12	40%	30	100%	0.251 _

Working	8	80 %	2	20 %	10	100%	
Income							
Low income	18	56 %	14	44 %	32	100%	0.020 _
High income	8	100 %	0	0 %	8	100%	

Table 2 shows that the results of the analysis of the relationship between parity, pregnancy distance, education, occupation and income that affect the incidence of Chronic Energy Deficiency (CED) in pregnant women namely the parity of pregnant women with SEZ as many as 14 people (36.8%), pregnancy distance of pregnant women with CED with a high risk of 9 people (56%), low education of pregnant women with SEZ as many as 10 people (45.5%), pregnant women with SEZ with no work as many as 12 people (40%), and low income pregnant women with SEZ as many as 14 people (44%). Based on the results of the *Chi Square* test, the value of $p = 0.000 < (0.05)$ on the variable distance of pregnancy and income shows a significant relationship that affects the incidence of chronic energy deficiency (CED) in pregnant women while on parity, education and occupation variables, there is no significant relationship that affects the incidence of chronic energy deficiency (CED) in pregnant women.

Discussion

Parity relationship What Affects the Incidence of Chronic Energy Deficiency (CED) in Pregnant Women

Based on the results of the cross tabulation between parity For mothers with chronic energy deficiency, it is known that there are 14 low-parity CED pregnant women (36.8%), while normal pregnant women with low parity are 24 people (63.2%) and normal pregnant women with high parity are 24 people. 2 people (100%). Based on the results of the *Chi Square statistical test*, the results showed that there was no relationship between parits and the incidence of chronic energy deficiency in pregnant women with $p = 0.287 < (0.05)$.

The results of this study are in line with Nugraha's research (2019) which showed that the number of parity had no effect on the incidence of CED in pregnant women because of the 34 pregnant women consisting of 18 multiparous pregnant women who had SEZ 10 and those who did not CED 8, while 16 primiparous pregnant women with SEZ were 9 and 7 were not. $P \text{ value} = 0.968 > (0.05)$.

So based on the observations of researchers, the first pregnancy for the mother is a pregnancy at risk of SEZ because the readiness of pregnant women and experience regarding pregnancy for pregnant women is still not qualified, this causes the energy intake of pregnant women to be insufficient. The condition of SEZ in pregnant women is most influenced by good food intake, because the consumption of good food intake can increase the mother's body metabolism so that even with many repeated pregnancies, the mother's energy savings can be maintained and the mother remains in a state of sufficient energy (Nugraha, 2010).

Pregnancy Distance Relationship What Affects the Incidence of Chronic Energy Deficiency (CED) in Pregnant Women

Based on the results of the cross tabulation between pregnancy interval Mothers with chronic energy deficiency events, it is known that CED pregnant women with high-risk pregnancy intervals are 9 people (56%), low-risk pregnancy intervals are 5 people (21%), while normal pregnant women with low-risk pregnancies are 19 people (79%).) and normal pregnant women with high-risk pregnancies were 7 people (44%). Based on the results of the *Chi Square statistical test*, the results showed that there was a relationship between the distance of pregnancy and the incidence of chronic energy deficiency in pregnant women with $p \text{ value} = 0.021 < (0.05)$.

The results of this study are in line with Suryani 's research (20-21) that there is a relationship between the distance of pregnancy and the incidence of Chronic Energy Deficiency (CED). did not experience SEZ from a number of 8 respondents whose pregnancies were close to each other. Statistical test results obtained p value = 0.000, it can be concluded that statistically at 0.05 there is a significant relationship between pregnancy distance and the incidence of Chronic Energy Deficiency (CED) in Pegayut Health Center, Pemulutan District, Ogan Ilir Regency, South Sumatra.

Based on the book Nutrition of Mothers and Children, written by Paramashanti, BA (2019), in addition to the mother's health condition, the distance between pregnancies must also be considered by a woman who has experienced pregnancy, especially with her first child. Why is the interval of pregnancy so important for a pregnant woman because a woman who is not two years away from the birth of her first child, is certainly not ready to experience another pregnancy. During the two years from the first pregnancy, a woman must really recover her body condition and improve the nutritional status of her body (Paramashanti, 2019).

Educational Relations What Affects the Incidence of Chronic Energy Deficiency (CED) in Pregnant Women

Based on the results of cross tabulation between education and chronic energy deficiency, it is known that pregnant women with SEZ nutritional status have low education as many as 10 people (45.5 %) and pregnant women with SEZ nutritional status have higher education as many as 4 people (22.2 %). Based on the results of the *Chi Square* statistical test , the results showed that there was no relationship between education and the incidence of CED in pregnant women, with p value = 0.125 > (0.05).

This study is in line with Triatmaja's research which says that there is no relationship between education and the incidence of CED in pregnant women in Kediri Regency with p value = 0.689 (Triatmaja, 2017). (Auliana, 2016) in his research showed the same result that there was no relationship between education and nutritional status of pregnant women with p value = 0.272. In contrast to the research conducted by Renjani, SR (2017), that there is a relationship between education and the incidence of CED in pregnant women in the Krueng Barona Jaya Health Center Aceh Besar with a p value of 0.001. These results indicate that pregnant women with low education have a 13.2 times greater chance of experiencing CED than those with higher education.

A person's education affects nutritional status because it is hoped that a higher level of education will improve nutritional knowledge and information, because nutritional problems that often occur are due to lack of information or ignorance about adequate nutrition (Muliawati, 2013).

Most of the pregnant women with CED 62.2% have low education, this situation is in accordance with the opinion of Helena (2013), that the level of education can be seen that mothers who do not go to school, do not graduate from elementary/junior high school are very much experiencing SEZ because with less knowledge it can affect consumption behavior and food intake, whereas mothers who graduated from high school/PT tend not to experience SEZ, with a high level of maternal education, mothers can consume nutritious food in order to meet the needs of the mother and baby .

Statistical analysis showed that there was no significant relationship between maternal education level and the incidence of CED in pregnant women. This is thought to be the influence of family income factors. High education of pregnant women with low purchasing power resulted in the nutritional needs of mothers during pregnancy both in terms of quality and quantity have not been met, eventually the mother experienced SEZ. The problem of SEZ in pregnant women also occurs in pregnant women with higher education due to ignorance and lack of information about adequate health and nutrition.

Employment Relationship What Affects the Incidence of Chronic Energy Deficiency (CED) in Pregnant Women

Based on the results of the cross tabulation between the work of mothers and the incidence of chronic energy deficiency, it is known that there are 12 SEZ pregnant women who do not work (40 %), working mothers as many as 2 people (20 %), while normal pregnant women who do not work as many as 18 people (60 %) and working mothers as many as 8 people (80 %). The results of the *Chi Square* statistical test showed that there was no relationship between work mothers with the incidence of chronic energy deficiency in pregnant women with $p \text{ value} = 0.251 < (0.05)$.

The results of this study are in line with Triatmaja's research (2017) that there is no relationship between work and the incidence of Chronic Energy Deficiency (CED). It was found that 14 pregnant women with chronic energy deficiency (27.5%) were unemployed. The results of statistical tests obtained $p \text{ value} = 0.269$, it can be concluded that there is no significant relationship between the work of pregnant women and the incidence of Chronic Energy Deficiency (CED) in Kediri Regency.

In this study, SEZ status was often found in mothers who did not work. This is in accordance with previous research which states that mothers who do not work have no additional income for the family so that if this is supported by a low husband's income, it will result in a low socio-economic level of the family.

Socio-economic factors that also influence the incidence of chronic energy deficiency in pregnant women in addition to physical work are family income. Family income affects the family's purchasing power of food consumed daily. The level of income can determine the pattern of food. Income is the most important factor in determining the quality and quantity of dishes. The more money you have, the better the food you get, in other words, the higher the income, the greater the percentage of that income to buy fruit, vegetables and several other types of food (Yuliastuti, 2014).

Income Relationship What Affects the Incidence of Chronic Energy Deficiency (CED) in Pregnant Women

Based on the results of the cross tabulation between maternal income and the incidence of chronic energy deficiency, it is known that SEZ pregnant women with low income are 14 people (37 %), while normal pregnant women with low income are 22 people (63 %), high income are 4 people (80 %). Based on the results of the *Chi Square statistical test*, the results showed that there was a relationship between maternal income and the incidence of chronic energy deficiency in pregnant women with $p = 0.020 < (0.05)$.

The results of this study are in line with Sukmawati's research, (2018) that there is a fairly strong relationship between income and the incidence of chronic energy deficiency with $p = 0.003 < (0.05)$. Febriyeni, (2017) in her research shows that there is a relationship between economic status and the incidence of chronic energy deficiency in pregnant women with $p \text{ value} = 0.005 < (0.05)$.

Income is a factor that determines the quality and quantity of food. In low-income households, 60% to 80% of real income is spent on food. This means that 70-70% of the energy is met by carbohydrates (rice and its substitutes) and only 20% is met by other energy sources such as fat and protein. An increase in income will lead to an increase in total expenditure, including the amount of expenditure on food (Febriyeni, 2017).

The level of income affects the nutritional needs of pregnant women. The level of family income that does not match what is needed, the less economic status usually has difficulty in providing nutritious food. A good nutritional status of pregnant women will later give birth to normal, healthy babies that are not susceptible to disease compared to mothers with less socioeconomic status, namely pregnant women with poor nutritional status (Andriani, 2015).

The level of income determines the diet and purchasing power of a person. If income increases, spending on food also increases. Thus income is a factor that determines the quantity and

quality of food which in turn will affect nutritional status. The higher the income, the greater the portion of calories from food sources both in terms of animal protein and from vegetable sources in the high-income group. Vice versa, the weaker or lower the income, the worse the level of fulfillment of nutritional needs. So that economic conditions affect a person's health condition, one of which is pregnant women (Najoan, 2010).

CONCLUSION

Based on the results of the research conducted, it can be concluded: 1) There is no Parity Relationship Affecting the Incidence of Chronic Energy Deficiency (CED) in Pregnant Women with a knowledge p-value of 0.287, 2) There is a Relationship between Pregnancy Distances Affecting the Incidence of Chronic Energy Deficiency (CED) in pregnant women with a p-value of knowledge that is 0.021, 3) There is no relationship between education that affects the incidence of chronic energy deficiency (CED) in pregnant women with a p-value of knowledge that is 0.125, 4) There is no relationship between work that affects the incidence of deficiency Chronic Energy (CED) in Pregnant Women with a knowledge p-value of 0.251, and 5) There is a relationship between income that affects the incidence of chronic energy deficiency (CED) in pregnant women with a knowledge p-value of 0.020.

Based on the conclusions of the research above, the recommendations for this study are: 1) For pregnant women, Willing to receive information from health workers, especially regarding the distance of pregnancy and family income which have risk factors for chronic energy deficiency, 2) For Puskesmas, Requires follow-up to the mother pregnant women who have high parity with close pregnancy distances in order to prevent or not experience chronic energy deficiency, namely by cross-program collaboration in increasing socialization programs through information, communication, and education to disseminate information on health factors related to the incidence of chronic energy deficiency during the period pregnancy, especially the use of booklets so that pregnant women can take them home to read at home, and 3) For other researchers, for further research it is also necessary to conduct research on other variables that are not discussed in this study.

References

- Almatsier S. 2011. *Gizi Seimbang dalam Daur Kehidupan*. Jakarta (ID): Gramedia Pustaka Utama.
- Alwan NA, Cade JE, McArdle HJ, Greenwood DC, Hayes HE and Simpson NAB. 2015. Maternal iron status in early pregnancy and birth outcomes: insights from the baby's vascular health and iron in pregnancy study. *British Journal of Nutrition*. 113(12): 1985-1992. Doi:10.1017/S0007114515001166
- Arisman, 2004. *Gizi dalam Daur Kehidupan*.EGC.Jakarta.
- Aviram A, Hod M, Yogev Y. 2011. Maternal obesity: Implications for pregnancy outcome and long-term risks – a link to maternal nutrition. *International Journal of Gynecology and Obstetrics*. 115(1): S6–S10.
- [BKKBN] Badan Koordinasi Keluarga Berencana Nasional. 2013. *Gerakan Keluarga Berencana dan Keluarga Sejahtera*. Jakarta (ID): BKKBN.
- [BKKBN] Jatim. 2015. *Cara-Cara Kontrasepsi Yang Digunakan Dewasa Ini*. Diakses: 20 Mei 2019. <http://www.bkkbn-jatim.go.id/>.
- Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, Ezzati M, Grantham-McGregor S, Katz J, Martorell R *et al*. 2013. Maternal and child undernutrition and overweight in low-income and middle income countries. *Lancet*. 382(9890): 427-51. Doi: 10.1016/S0140-6736(13)60937-X.
- Cheng Y, Dibley MJ, Zhang X, Zeng L, Yan H. 2009. Assessment of dietary intake among pregnant women in a rural area of western china. *BMC Public Health*. 9(222): 1-9. Doi: 10.1186/1471-2458-9-222.
- Fanta C.H., 2009, Drug Therapy of Asthma, *The New England Journal of Medicine*, London, UK.
- [FAO] Food and Agriculture Organization. 2011. *FAO Data-bases and Data-sets*. <http://faostat.fao.org/site/569/default.aspx#ancor>. [27 Mei 2019].
- Fischer NC, Shamah-Levy T, Mundo-Rosas V, Mendez-Gomez-Humaran I, Perez-Escamilla R. 2014. Household food insecurity is associated with anemia in adult Mexican women of reproductive age. *J Nutr*. 144(12):2066-72. Doi: 10.3945/jn.114.197095.

- Fowles ER, Bryant M, Kim SH, Walker LO, Ruiz RJ, Timmerman GM, Brown A. 2011. Predictors of dietary quality in low-income pregnant women: a path analysis. *Nurs Res.* 60(5): 286-294. Doi: 10.1097/NNR.0b013e3182266461.
- Gibson RS. 2005. *Principals of Nutrition Assessment*. Oxford (UK): Oxford University Press.
- Harding R, Bocking AD. 2001. *Fetal Growth and Development*. Cambridge (UK): Cambridge University Press.
- Hardinsyah, Atmojo SM. 2000. *Pengendalian Mutu dan Keamanan Pangan*. Jakarta (ID): PERGIZI PANGAN.
- Karaoglu L, Pehlivan E, Egri M, Deprem C, Gunes G, Genc MF, Temel I. 2010. The prevalence of nutritional anemia in pregnancy in an east Anatolian province, Turkey. *BMC Public Health.* 10(329): 1-12. Doi: 10.1186/1471-2458-10-329.
- Kedir H, Berhane Y, Worku A. 2016. Magnitude and determinants of malnutrition among pregnant women in eastern Ethiopia: evidence from rural, community-based setting. *Maternal and Child Nutrition.* 12(1): 51-63. Doi: 10.1111/mcn.12136.
- Kotut J, Wafula S, Etyang G, Mbagaya G. 2014. Protein-energy malnutrition among women of child bearing age in semi arid areas of Keiyo district, Kenya. *Advances in Life Science and Technology.* 24(1): 80-92.
- Mengesha AD, Ayele TT. 2015. The impact of culture on the nutritional status of children and mothers during recurring food insecurity: the case of boreicha woreda (snnprs). *American Journal of Educational Research.* 3(7): 849-867. Doi: 10.12691/education-3-7-8.
- Brown JE. 2011. *Nutrition through Life Cycle*. Belmont (US): Wadsworth Cengage Learning.
- Moursi M, Arimond M, Dewey KG, Treche S, Ruel MT. 2008. Dietary diversity is a good predictor of micronutrient density of the diet of 6 to 23 month old children in Madagascar. *The Journal of Nutrition.* 10(235): 2448-2553
- Ramakrishnan U, Grant F, Goldenberg T, Zongrone A, Martorella R. 2012. Effect of women's nutrition before and during early pregnancy on maternal and infant outcomes: a systematic review. *Paediatric and Perinatal Epidemiology.* 26 (1): 285-301. Doi: 10.1111/j.1365-3016.2012.01281.x
- [RISKESDAS] Riset Kesehatan Dasar. 2007. Jakarta: Badan Penelitian dan Pengembangan Kesehatan, Departemen Kesehatan, Republik Indonesia.
- Savy M, Martin-Pre'vell Y, Sawadogo P, Kameli Y, Delpeuch F. 2005. Use of variety/diversity scores for diet quality measurement: relation with nutritional status of women in a rural area in Burkina Faso. *European Journal of Clinical Nutrition.* 9(5):703-716. Doi:10.1038/sj.ejcn.1602135.
- Sugiyono. 2010. *Metode Penelitian Pendidikan Pendekatan Kuantitatif, kualitatif, dan R&D*. Bandung: Alfabeta
- Supariasa, dkk. 2002. *Penilaian Status Gizi*. Jakarta : Penerbit Kedokteran EGC.
- [UNICEF] United Nations Children's Fund. 1990. *Strategy for Improved Nutrition of Children and Women in Developing Countries*. New York (US): UNICEF.
- VanderJagt DJ, Brock HS, Melah GS, El-Nafaty AU, Crossey MJ, Glew RH. 2007. Nutritional factors associated with anaemia in pregnant women in northern Nigeria. *J Health Popul Nutr.* 25(1): 75-81.
- Völgyi E, Carroll KN, Hare ME, Ringwald-Smith K, Piyathilake C, Yoo WS, Tylavsky FA. 2013. Dietary patterns in pregnancy and effects on nutrient intake in the mid-south: the conditions affecting neurocognitive development and learning in early childhood (candle) study. *Nutrients.* 5(5): 1511-1530. Doi: 10.3390/nu5051511.
- [WHO] World Health Organization. 2015. Pregnancy [Internet]. [diunduh 20 Mei 2019]. Tersedia pada: <http://who.int>.
- Willy K, Judith K, Peter C. 2016. Dietary diversity, nutrient intake and nutritional status among pregnant women in Laikipia County, Kenya. *International Journal of Health Sciences & Research.* 6(4): 378-385.