



Effects Of Nutrition On Pregnancy Among Rural Women In Gboko Local Government Area Of Benue State

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ABSTRACT

The study examined the effects of nutrition on pregnancy among rural women in Gboko Local Government area of Benue State. Three (3) specific objectives were stated reflecting the variables and three (3) research questions were raised and answered. Three (3) hypotheses were formulated and tested at 0.05 level of significance. The study employed the use of descriptive survey design. Out of a population of 327 health workers, 180 were sampled using Taro Yamane sample formula. The study adopted the use of Bourley's proportional technique to determine the number of respondents to be selected in each of the clan based on the population for fair representation. Thus random sampling technique was used to ensure an equal chance of selection and participation of the respondents. Data was collected through the use of a self structured questionnaire titled, "Effect of Nutrition on Pregnancy Questionnaire (ENPQ)" and analyzed using descriptive statistic which were subjected to Statistical Package for Social Science (SPSS). Frequencies and percentages were used to analyze the demographic data while mean and standard deviation were used to answer the research questions. Chi-square test of goodness-of-fit was used to test the hypotheses at 0.05 level of significance. The findings showed that, poor nutrition during pregnancy has a significant effect on anemia. It also revealed that, poor nutrition during pregnancy has a significant effect on low birth weight of newborn babies. Finally, the study established that, poor nutrition during pregnancy has a significant effect on miscarriage of pregnancy. Based on the findings, it was recommended that, household should take a radical approach to ensure an increment in household income in other to be able to provide the family with food items to improve dietary practice, pregnant women should consider antenatal care paramount to maintain healthy living throughout the period of pregnancy, health care providers and other stakeholders should consider educating women at various times on the importance of nutrition to pregnancy and as well educate them on types of foods to eat during pregnancy and pregnant women should cultivate the habit of eating fresh food found in our immediate community since Nigeria and Benue in particular produce a variety of food which can enhance their health rather than depending on foreign food with high cost among others.

Keywords: Nutrition, Pregnancy, Anemia, Low Birth weight, Miscarriage

INTRODUCTION

Pregnancy constitutes a state of considerable physiological nervous tension which compels increased nutritional demands. This nutrition has a major effect on both the health of a mother and the baby. Nutrition plays a major role in maternal and child health. Poor maternal nutritional status has been related to adverse birth result; however, the association between maternal nutrition and birth outcome is complex and is inclined by biological, socioeconomic and demographic factors, which differ widely in different population (Vilar, Merialdi & Gulmezoglu, 2003). Understanding the relationship between maternal

nutrition and birth outcomes may provide a basis for developing nutritional interventions that will improve birth results and long term quality of life and reduce mortality, morbidity and health care cost.

Safaa, Eshra and Saleem (2016) noted that, maternal malnutrition increases the risk of gestational anemia, hypertension, miscarriages and fetal deaths during pregnancy, pre-term delivery and maternal mortality. For the newborn babies, it can cause low birth weight, fetal intrauterine, growth retardation that may have long life consequences on newborn development, quality of life and health care costs. Malnutrition also has an adverse effect on the development of the immune system of the newborn. Current research underscores that the first 1000 days of life, from conception up to two years of life are crucial for the prevention of adulthood diseases. In any case, pregnant women are not like every other individual, this is because; they need more blood, fluid and other nutrients to be able to maintain their body and for the proper development of the foetus.

Nutrition in pregnant women starts from the very first day of conception through the period of pregnancy to delivery. Even after delivery, the mother is expected to maintain quality nutrition. This is because; mothers still breast feed their babies with pure milk which is expected to be the only food for the effective development of the baby.

However, the seeming trend of maternal mortality, morbidity, miscarriages, and anemia among others in pregnant women across the world has become a contending issue and source of worry by all across the globe as it is said to be on ascendency. The WHO, UNICEF and UNFPA statistics in 2019 indicated that, every day in 2017, approximately 810 women died from preventable cause related to pregnancy and child birth. This causes ranges from poor diet, high blood pressure, bleeding, anemia, miscarriages among others. In the context of the (MDGs), countries have developed a new target to accelerate the decline of maternal mortality by 2030. This phenomenon is not an exception to Nigeria in general and Benue State in particular.

In view of this, world leaders in the year 2000, agreed and come up with eight (8) goals termed the millennium development goals (MDGs) which were expected to be achieved by the year 2015. Among these goals was the maternal health which encompasses nutrition of pregnant women among others. This was focused at preventing the death rate of both the mother and the child as a result of some preventable factors which nutrition was not an exception. Consequently, as the year 2015 rounds up, the world leaders again moved over to the sustainable development goals (SDGs) with health care inclusive as one of their goals.

In Nigeria and Benue State in particular, there has been prevalent reports of maternal malnutrition in different quarters which is said to have an adverse effect on the mother and the unborn child most especially in the rural areas. There are many recorded cases of still birth, maternal mortality, anemia, morbidity low birth weight and immune system of newborn babies. This could be as a result of poor nutrition among pregnant women.

This study therefore, investigates the unclear effects of nutrition on pregnancy among rural women in Gboko Local Government Area of Benue State. This idea is aimed at bringing to the fore the importance of nutrition during pregnancy.

Statement of the Problem

The decline status of maternal nutrition of pregnant women across Benue State has become a source of worry to all health care providers, home economists, food nutritionists and other health stake holders. It has been observed that, there has been public outcry over time now on the poor diet intake of pregnant women, most especially in the rural areas of Benue State, including Gboko local government area. This is exemplified by the increasing rate of maternal mortality recorded across these areas. It has also been observed that year in year out, a significant number of pregnant women lost their lives or babies as a result of anemia during pregnancy. This recurring factor has been identified to be the utmost primary factor leading to maternal mortality among newborn. More also, it has been perceived that, there are repeated issues of bleeding and miscarriages among pregnant women. This however results to lose of pregnancy, making many women childless up till date. It is also evident that, there have been numerous cases of still birth and low birth weight of babies. Such children even at death weigh below 2500 grams. It

also appears that, there have been frequent issues of miscarriages and bleeding among pregnant women. This situation renders most women in Benue State childless up till date. In view of these, it is rational to assume that, such situations are as a result of a number of factors which nutrition is not an exemption. This problem calls for a proper investigation and understanding whether nutrition actually affects women during pregnancy and or their foetus even long after birth. It is in light of this that, this study investigates the Effect of Nutrition on Pregnancy among Rural Women in Gboko Local Government Area of Benue State.

Purpose of the Study

The purpose of this study was to determine the effects of nutrition on pregnancy among rural women in Gboko Local Government Area of Benue State. Specifically, the study sought to:

1. Determine the effect of poor nutrition on anemia during pregnancy.
2. Establish the effect of poor nutrition on low birth weight of new babies.
3. Ascertain the effect of poor nutrition on miscarriage of pregnant women.

Research questions

For the purpose of this study, the following questions were generated by the researchers;

1. Is there any significant effect of poor nutrition on anemia during pregnancy?
2. Does poor nutrition have any significant effect on low birth weight of new babies?
3. What is the effect of poor nutrition on miscarriage of pregnancy?

Research Hypothesis

The following hypotheses guided the study:

1. There is no significant effect of poor nutrition on anemia during pregnancy.
2. There is no significant effect of poor nutrition on low birth weight of new babies.
3. There is no significant effect of poor nutrition on miscarriage of pregnancy.

Review of Literature

Martin (2010), defined pregnancy as the period during which a woman carries a developing foetus, normally in the uterus. To Shaffer and Kipp (2010) pregnancy is a period when a sperm penetrates the wall of an ovum, forming a zygote. Therefore, pregnancy can be seen as a situation where a life sperm meet the ovum usually in one of the fallopian tubes to form a zygote. Wyatt and Wyatt (1973) noted that pregnancy last for nine months, during which the baby grows and develops from a fertilized cell inside the mothers uterus called womb. The developing baby lies curled up in a bag of membranes filled with fluid. Approximately, pregnancy takes 226 days from conception until the baby is born or 280 days from the first day of the last menstruation period. Pregnancy from conception to birth takes three phases namely, *zygote embryo* and *foetus* period. The zygote period lasts about 10 to 14 days, embryo period experience the formation of major organs of the baby and the heart begins to beat while foetus period witness rapid growth and functioning of the organ system (Leese, 1994; Corsini, 1994 & Maet, 2004).

For maternal and health of the developing child to be achieved, proper nutritional status of the pregnant woman must be considered. Good dietary habits during pregnancy play a significant role in determining the long-term nutritional status of both the mother and the unborn baby (Gibore, Ngowi, Munyogwa & Ali, 2020).

Nutrition according to Gibney, Lanham-New, Cassidy, and Vorster (2009) is the description of the processes whereby cellular organelles, cells, tissues, organs, systems, and the body as a whole obtain and use necessary substances obtained from foods (nutrients) to maintain structural and functional integrity. To World Health Organization (2017) nutrition is the intake of food necessary for optimal growth, function, and health, whereas good nutrition refers to the intake of a well-balanced diet that provides all essential nutrients in optimal amounts and proportions. Poor nutrition on the contrary is a situation of intake of diet lacking nutrients either from overall insufficient food intake or from imbalance. From the above definitions, it can be deduced that, nutrition is a process whereby the human body obtained and uses substances from food in correct proportion for optimal growth, function and health. Nutrition plays a major role in maternal and child health. Poor maternal nutritional status has been related to adverse birth result; however, the association between maternal nutrition and birth outcome is complex and is inclined by

biological, socioeconomic and demographic factors, which differ widely in different population (Vilar, Merialdi & Gulmezoglu, 2003). Birth outcome could be favorable or unfavorable depending on the nutritional status. Maternal malnutrition could result in low birth weight (Victora, Adair, Fall, Hallal, Martorell, & Richter, 2008), miscarriage (Ahmadi, Ziaei & Parsay, 2016) and anaemia (Stevens, Finucane, De-Regil, Paciorek, Flaxman, Branca, Peña-Rosas, Bhutta & Ezzati 2013). The pregnant woman, therefore, needs to have a dietary intake sufficient to provide energy and nutrients for the mother as well as foetus (King, 2000).

METHODOLOGY

The study employed the use of descriptive survey design. The population of the study consist three hundred and twenty-seven (327) local government human health personnel staff cutting across all the Local Government Primary Health Care clinics in Gboko Local Government Area which is the Area of the study. Specifically, Gboko Local Government is made up of five clans namely; Mbayion, Ipav, Yandev, Mbativ and Mbatyerev where the Local Government Primary Health Clinics are located. A sample of one hundred and eighty (180) respondents was selected using Taro Yemini sample formula, representing 55% of the total population. The study further adopts the use of Bourley's Proportional Allocation Technique to determine the number of respondents to be selected in each of the clan based on the population for fair representation thus; Mbayion (47), Ipav (29), Yandev (25), Mbativ (41) and Mbatyerev (38). Random sampling technique was used to ensure an equal chance of selection and participation. The instrument for data collection was researchers made titled "Effects of Nutrition on Pregnancy Questionnaire (ENPQ)". It consists of 15 items and is divided into two sections. While section "A" consisted of the bio-data of respondents, section "B" consisted of items on effects of nutrition on maternal anemia, low birth weight and miscarriage respectively. The instrument was a four point Likert type rating scale with responses as Strongly Agreed (SA) 4 points, Agreed (A) 3 points, Disagreed (D) 2 points, and Strongly Disagreed (SD) 1 point. The instrument was validated by three experts in Home and Rural Economics from Akperan Orshi Polytechnic, Yandev. ENPQ was pilot tested on 24 respondents in the study area who did not form part of the sample for the study. The analysis yielded Cronbach-alpha of .72 which suggested that the instrument was reliable. Data collected was analyzed using frequencies and percentages for the bio-data while mean and standard deviation were used to answer the research question. A cut-off point of 2.50 was set for decision making. Any mean score of 2.50 and above was accepted as having the desired impact while mean scores of less than 2.50 were rejected as not having effect. Chi-square (χ^2) test of goodness-of-fit was used to test hypothesis at 0.05 level of significance, which serves as the bench for decision making.

RESULTS

Research Question 1: *Is there any significant effect of poor nutrition on anemia during pregnancy?*

Table 1: Mean and Standard Deviation of Effect of Poor Nutrition during Pregnancy on anemia

Item No	Item Description	SA	A	D	SD	X	Std	Decision
1	Food nutrients in their right proportion provide adequate blood to the body	80	78	15	7	3.28	0.77	Accepted
2	Poor nutrition could cause inadequate foetal iron stores.	40	102	31	7	2.97	0.74	Accepted
3	Iron deficiency causes anaemia	68	84	24	4	3.20	0.75	Accepted
4	Low nutritional quality of the diet has a significant effect on both the mother and the developing foetus.	63	80	30	7	3.10	0.81	Accepted
5	Inadequate hemoglobin, myoglobin and various enzymes deter transfer of oxygen to tissues.	40	101	31	8	2.96	0.75	Accepted
Cluster Mean and Standard Deviation						3.10	0.76	Accepted

Table 1 shows the mean ratings of health workers in Gboko Local Government area of Benue State with regards to the effect of poor nutrition during pregnancy on anemia. The data indicates that the mean

ratings of health workers responses for item 1-5 are 3.28, 2.97, 3.20, 3.10 and 2.96 with their corresponding standard deviation of 0.77, 0.74, 0.75, 0.81 and 0.75. Based on the data, all the means rating are above the cut –off point of 2.50. The respondents views are that, food nutrients in their right proportion provide adequate blood to the body and as such, poor nutrition could cause inadequate foetal iron stores, while iron deficiency causes anemia. Also that, low nutritional quality of diet has a significant effect on both the mother and the developing foetus and Inadequate hemoglobin, myoglobin and various enzymes deter transfer of oxygen to tissues.

The cluster mean of 3.10 and a standard deviation of 0.76 were also found to be above the cut-off point of 2.50, which indicates that respondents share the view that poor nutrition during pregnancy has a significant effect on anemia.

Research Question 2: *Does poor nutrition have any significant effect on low birth weight of new babies?*

Table 2: Mean and Standard Deviation of Effect of Poor Nutrition during Pregnancy on Low Birth weight of new Babies

Item No	Item Description	SA	A	D	SD	X	Std	Decision
6	Malnutrition of a pregnant woman may cause growth restriction of foetus before birth	40	102	31	7	2.97	0.74	Accepted
7	Poor nutrition of pregnant woman affect the weight of a newborn	52	84	32	12	2.97	0.85	Accepted
8	Malnutrition during the third trimester of pregnancy may cause fewer brain cells and lower brain weight of the baby	68	79	24	9	3.14	0.83	Accepted
9	Malnutrition during pregnancy may cause impaired skeletal development of the foetus	25	116	28	11	2.86	0.72	Accepted
10	Poor nutrition of pregnant woman may retard tissue development of the foetus	57	80	29	14	3.00	0.89	Accepted
Cluster Mean and Standard Deviation						2.99	0.80	Accepted

Table 2 shows the mean ratings of health workers in Gboko Local Government area of Benue State with regards to the effect of poor nutrition during pregnancy on low birth weight of new babies. The data indicates that the mean ratings of health workers responses for item 6-10 are 2.97, 2.97, 3.14, 2.86 and 3.00 with their corresponding standard deviation of 0.74, 0.85, 0.83, 0.72 and 0.89. Based on the data, all the means rating are above the cut-off point of 2.50. The respondents views are that, malnutrition of a pregnant woman may cause growth restriction of foetus before birth and may affect the weight of a newborn. Also malnutrition during the third trimester of pregnancy may cause fewer brain cells and lower brain weight of the baby, cause impaired skeletal development of the foetus and may as well results to retard tissue development of the foetus. The cluster mean of 2.99 and a standard deviation of 0.80 were also found to be above the cut-off point of 2.50, which indicates that respondents share the view that poor nutrition during pregnancy has a significant effect on low birth weight of new babies.

Research Question 3: *What is the effect of poor nutrition on miscarriage of pregnancy?*

Table 3: Mean and Standard Deviation of Effect of Poor Nutrition during Pregnancy on Miscarriage

Item No	Item Description	SA	A	D	SD	X	Std	Decision
1	Good nutrition can boost the immune system of the mother and foetus	63	80	30	7	3.10	0.81	Accepted
2	Poor nutrition could lead to miscarriage of pregnancy	40	102	31	7	2.97	0.75	Accepted
3	Malnutrition may expose a mother to other diseases which could cause miscarriage	63	80	30	7	3.10	0.81	Accepted
4	Poor nutrition could cause inadequate amount of folic acid and vitamins which are essential for normal embryogenesis	40	102	31	7	2.97	0.74	Accepted
5	Well nourished mothers have more chances of safe pregnancy in relation to miscarriage	50	84	34	12	2.95	0.85	Accepted
Cluster Mean and Standard Deviation						3.01	0.79	Accepted

Table 3 shows the mean ratings of health workers in Gboko Local Government area of Benue State with regards to the effect of poor nutrition during pregnancy on miscarriage. The data indicates that the mean ratings of health workers responses for item 11-15 are 3.10, 2.97, 3.10, 2.97 and 2.95 with their corresponding standard deviation of 0.81, 0.75, 0.81, 0.74 and 0.85. Based on the data, all the means rating are above the cut-off point of 2.50. The respondents views are that, good nutrition can boost the immune system of the mother and foetus, poor nutrition could lead to miscarriage of pregnancy, malnutrition may expose a mother to other diseases which could cause miscarriage, poor nutrition could cause inadequate amount of folic acid and vitamins which are essential for normal embryogenesis and well nourished mothers have more chances of safe pregnancy in relation to miscarriage. The cluster mean of 3.01 and a standard deviation of 0.80 were also found to be above the cut-off point of 2.50, which indicates that respondents share the view that poor nutrition during pregnancy has a significant effect on miscarriage.

Testing of Research Hypothesis

Hypothesis one: Poor nutrition during pregnancy has no significant effect on anemia

Table 4: chi-square test on effect of poor nutrition during pregnancy on anemia

Variables	N	Df	X cal	Level of sign	Alpha Level	Decision
Poor nutrition Anemia	180	13	311.867	.000	.05	Significant

Table 4 shows the Chi-square value of 311.867, a degree of freedom (df) =13 and a level of significant (Probability value) of 0.000 which is less than the Alpha value of .05. Since the Probability value < .05, the result is significant; therefore the null hypothesis was rejected. This implies that, poor nutrition during pregnancy has a significant effect on anemia in Gboko Local Government area of Benue State.

Hypothesis two: Poor nutrition during pregnancy has no significant effect on low birth weight of new babies

Table 5: chi-square test on effect of poor nutrition during pregnancy on low birth weight of new babies

Variables	N	Df	X cal	Level of sign	Alpha Level	Decision
Poor nutrition low birth weight of new babies	180	15	373.778	.000	.05	Significant

Table 5 shows the Chi-square value of 373.778, a degree of freedom (df) =15 and a level of significant (Probability value) of 0.000 which is less than the Alpha value of which is .05. Since the Probability value<.05, the result is significant; therefore the null hypothesis was rejected. This implies that, poor nutrition during pregnancy has a significant effect on low birth weight of new babies in Gboko Local Government area of Benue State.

Hypothesis three: Poor nutrition during pregnancy has no significant effect on miscarriage

Table 5: chi-square test on effect of poor nutrition during pregnancy on miscarriage

Variables	N	Df	X cal	Level of sign	Alpha Level	Decision
Poor nutrition miscarriage	180	8	203.700	.000	.05	Significant

Table 5 shows the Chi-square value of 203.700, a degree of freedom (df) =8 and a level of significant (Probability value) of 0.000 which is less than the Alpha value of which is .05. Since the Probability value<.05, the result is significant; therefore the null hypothesis was rejected. This implies that, poor nutrition during pregnancy has a significant effect on miscarriage in Gboko Local Government area of Benue State.

DISCUSSION OF FINDINGS

Hypothesis one indicated that, poor nutrition during pregnancy has significant effect on anemia. This finding agreed with Gibore, Ngowi, Munyogwa and Ali, (2020) which also affirmed that, anemia during pregnancy is significantly associated with inadequate dietary diversity. Almurshed, Bani, Al-Kanhal, and Al-Amri, (2007) in addition, reported that, the average nutrient intake of pregnant women was deficient in some important nutrients, resulting in anemia. The agreement of this with the findings of this study may not be surprising since some pregnant women restrict their food intake during pregnancy, for fear of having a large-for-gestational-age baby, which they think can predispose them to birth complications. This dietary habit can result in low intake of essential nutrients like protein, vitamin C, vitamin A, and iron which are basic nutrients for the increase of red blood cell. As such, approximately 50% of all anemias are estimated to be caused by low dietary intake of iron, poor absorption of dietary iron, or blood loss.

Hypothesis two revealed that poor nutrition during pregnancy has significant effect on low birth weight of new babies. This finding agreed with the previous study of Shaffer and Kipp (2010) who reported that, malnutrition is more likely to result in low birth weight of babies with small heads who may fail to survive the first year of life. Similarly, Jyoti, Kaur, and Kaur (2016) in their research found out that, maternal nutrition show a positive connection with infant birth weight, maternal pre-pregnancy body weight mass index (MBI) and weight gain during pregnancy. Low body weight is a major determinant of mortality, morbidity in infancy and childhood and also has long term impact on health outcomes in adult life. Lack of adequate nutrition of good quality and quantity during pregnancy can cause health problems for both the mother and the new born.

Hypothesis three indicated that, poor nutrition during pregnancy has a significant effect on pregnancy miscarriage. This finding agreed with Ahmadi, Ziaei, and Parsay, (2016) who reported that, a number of spontaneous abortion are caused by chromosomal abnormalities, maternal factors which nutritional status is not an exception. Jyoti, Kaur, and Kaur (2016) in addition reported that, poor nutrition could be associated with spontaneous preterm delivery risk. This implies that, some nutrient deficiency could cause certain conditions that can lead to miscarriage.

CONCLUSION

Based on the results of this study, it has been established that, nutrition has a significant effect on pregnancy in Gboko Local Government of Benue State. Thus, health care providers and other stakeholders should consider educating women at various times on the importance of nutrition to pregnancy and as well educate them on types of foods to eat during pregnancy.

RECOMMENDATIONS

The results of this study require urgent attention especially for intending and married women. Thus the following recommendations are made:

- i. Pregnant women should consider antenatal care paramount to ensure consistent check up to be able to maintain a healthy living throughout the period of pregnancy.
- ii. Health care providers and other stakeholders should consider educating women at various times on the importance of nutrition to pregnancy and as well educate them on types of foods to eat during pregnancy.
- iii. Government should as a matter of urgency initiate nutritional programs to consistently reach the people through radio, television and other information disseminating mediums to ensure proper and adequate education of pregnant women to reduce the problem of poor nutrition during pregnancy among women.
- iv. Pregnant women should cultivate the habit of eating fresh food found in our immediate community since Nigeria and Benue in particular produce a variety of food which can enhance their health rather than depending on foreign food with high cost.

REFERENCES

- Almurshed, K. S, Bani, I. A., Al-Kanhal, M.A., Al-Amri, M.A. (2007) A study of maternal dietary intake during pregnancy in Riyadh, Saudi Arabia. *J Family Community Med.*14(1):9.
- Gibore, N. S., Ngowi, A. F., Munyogwa, M. J. Ali, M. M. (2020)
- Jyoti, S., Kaur, V. and Kaur, J . (2016) Effect of prenatal malnutrition on foetus and newborn baby: a comprehensive review. *International Journal of Science and Research (IJSR)* 7.6: 150-156
- Ahmadi, R., Ziaei, S. & Parsay, S. (2016). Association between nutritional Status with spontaneous abortion. *International Journal of fertility and Steril*, 10(4), 337-342
- Gibney, M. J., Lanham-New, S. A., Cassidy, A. & Vorster, H. H. (2009) Introduction to human nutrition. (2nd ed). London: John Wiley & Sons, Ltd.
- Martin, E. A. (2010) Oxford Concise Medical Dictionary. USA: Oxford University Press Inc
- Safaa S., Eshra D. & Saleem N. (2016). Effect of malnutrition during pregnancy on pregnancy outcomes. 18th International Conference on nursing and healthcare. Dalla, USA. *J Nurs Care* 5:10
- Shaffer, D. R., & Kipp, K. (2010). Developmental psychology of childhood and adolescence (8th ed). Canada: Cengage Learning
- Stevens, G.; Finucane, M.; De-Regil, L.M.; Paciorek, C.; Flaxman, S.; Branca, F.; Peña-Rosas, J.P.; Bhutta, Z.A. & Ezzati, M. (2013) Global, regional, and national trends in total and severe anaemia prevalence in children and pregnant and non-pregnant women. *Lancet Glob. Health.*1,e16–e25.
- Victora, C. G., Adair L., Fall, C., Hallal, P. C., Martorell, R., Richter, L., et al. (2008). Maternal and child undernutrition: Consequences for adult health and human capital. *Lancet* 371. 340-57.
- World Health Organization (2017). Health topics: Nutrition. Available from: <http://www.who.int/topics/nutrition/en/>. Retrieved 19/03/2020.
- Ziaei, S., Janghorban, R., Shariatdoust, S. & Faghihzadeh, S. (2008) The effect of iron supplementation on serum copper and zinc level in pregnant women with high-normal hemoglobin. *Int. J Gynecol Obstet*, 100 (2), 133-135.
- Wyatt, G. G. and Wyatt, J. L. (1973) Medical assistant's manual. US: McGraw-Hill Inc.