ACTA SCIENTIFIC NUTRITIONAL HEALTH

Volume 3 Issue 7 July 2019

Research Article

Pregnant Women's Dietary Practices in Relation to Anthropometric Status of Infants Aged 0-6 Weeks in Vhembe District, Limpopo Province

Matsea Z*, Motadi SA, Mahopo TC and Mushaphi LF

University of Venda, Thohoyandou, South Africa

***Corresponding Author:** Matsea Z, University of Venda, Thohoyandou, South Africa.

Received: May 09, 2019; **Published:** June 04, 2019

Abstract

Objectives: To determine the maternal dietary practices in relation anthropometric status of infants aged 0-6 weeks.

Design: Cross sectional study

Participants: Two hundred and forty (240) pregnant women and their infant. participants were selected conveniently from four (4) clinics in Vhembe District from August to September 2014.

Variables Measured: Anthropometric measurements (weight and height) were made following standard techniques. Data on dietary practices and socio-demographic information were collected using a structured questionnaire.

Analysis: The z-scores were calculated using computer software (WHO Anthro version 2.0). Weight-for-age <-3 standard deviation (SD) is regarded as severely underweight, between -3SD to <-2SD is regarded as underweight. Pearson correlation coefficient was used to test association between variables and ANOVA was used to test significant differences within groups. A $p < 0.05$ was considered statistically significant.

Results: Forty-five percent of the study participants have eaten carrots, bananas, apples, spinach, cabbage and beetroots during pregnancy, while 26.7% ate carrots, oranges, bananas, apples, spinach, cabbage and beetroots during pregnancy. The mothers BMI was positively associated with WAZ (r=0.48; p=0.515). There was a positive association between mothers BMI and HAZ (r=0.103; p=0.158) however when mothers BMI was correlated to BAZ the association was negatively significant (r=-0.206; p=0.004).

Conclusion: Maternal age and dietary practices during pregnancy have a significant impact on the birth outcomes. The mother's weight during pregnancy is not the only the contributing factor to infant's weight during birth.

Keywords: Maternal; Dietary Practices; Anthropometric Status; Infants; Weight Gain

Introduction

Nutrient intake and weight gain during pregnancy are the two main modifiable factors influencing maternal and infant outcomes. Micronutrient deficiencies such as calcium, iron, folate and vitamin A can lead to poor maternal health outcomes and pregnancy complications which put the mother and the baby at risk of mortality [1]. "Poor maternal weight gains in pregnancy due to inadequate balanced diet increases the risk of premature delivery, low birth weight and birth defects" [2]. Low body mass index (BMI) and suboptimal weight gain during pregnancy are long-recognized risk factors for the delivery of infants small for gestational. Furthermore, strong evidence has been gathered about weight gain during pregnancy and birth weight particularly during the second and third trimesters of pregnancy [1].

Socio-economic factors have been identified as one of the most important groups of neighbourhood-level risks affecting birth outcomes in developing countries. In contrary, developed countries has uncertainties that still exist concerning the pathways through which they are transferred to individual risk factors [3]. Low weight gain could mean an increased risk of giving birth to low birth weight babies and these babies are at increased risk of mortality and developmental problems. Furthermore, nutrition before, during and after pregnancy can have a significant effect

on the long term health of both the infant and the mother. The potential impact of nutrition is greater at during pregnancy than during any stage of life [4].

Foetus which are undernourished in the womb are at risk of undesirable consequences, ranging from low birth weight to severe mental and physical retardation and even death. Mostert [3] reported that the effect of under-nutrition during pregnancy depends on the nutrient(s) involved and the stage at which under-nutrition occurs. Gray [12] indicated that adequate folic acid intake will reduce the risk of the unborn baby developing congenital defects, and this is also true for iron in reducing the levels of maternal anaemia. "Micronutrient adequacy will have an impact on the ability of the mother to provide optimal feeding and lactation after delivery" [3,5,6]. The high prevalence of preterm babies born in local clinics around Vhembe district prompt the study of dietary practices during pregnancy and anthropometric status of their infants. It has been reported that South Africa has low birth weight rate of 24% and perinatal mortality of 15, 4% [25]. This study was the first to be conducted in Vhembe district of Limpopo province in order to establish the extent of Pregnant women's dietary practices in relation to anthropometric status of infants aged 0-6 weeks.

Methods and Design

Study design

A cross sectional descriptive study was carried out in two hundred and forty (240) pregnant women and their infant. Pregnant women and their infants were selected conveniently from four (4) clinics in Vhembe District from August to September 2014. Anthropometric measurements were made following standard techniques.

Vhembe district has one hundred and twelve clinics. The study was conducted in Vhembe district which is one of five municipal districts of Limpopo province. The district is divided into four municipalities namely Thulamela, Makhado, Musina and Mutale. According to 2011 census, 1,294,722of Vhembe residents speak Venda as their mother language, 587,621 speak Tsonga, 442,184 speak Afrikaans and 213,006 speak Pedi (Stats SA, 2011).

Study population and sampling strategy

The study participants where mothers who already delivered and their infants. Simple random sampling was used to select four clinics from one hundred and twelve clinics in Vhembe district due their accessibility to the researchers. The study participants were selected by convenient sampling. Only mothers with infants aged 0-6 weeks and who signed the written consent form were included in the current study. Mothers with known mental health problems were excluded from the study.

Infants (0-6 weeks) born with illness and those who were ill at the time of data gathering were also excluded from the study. Foreign nationals with infants 0-6 weeks did not form part of the study as well.

Data collection

An interviewer-administered questionnaire was used to collect data from the study participants. Participants were interviewed individually in a private room to ensure privacy. The questionnaire was piloted and pre-tested to check the feasibility and understanding of the wording and phrasing of the questions. The results helped the researcher to make changes accordingly where questions were not understandable and also helped to make questionnaire effective and refined before the survey. Data were collected using a questionnaire which had three sections, namely; socio-demographic information, dietary practices of mothers, and anthropometric measurements. The questionnaire was developed and then later translated into local language spoken in Venda. Experts from the department of linguistic at the University of Venda carried out this exercise.

Anthropometric assessments were performed according to standard procedures described by the International Society for the Advancement of Ki anthropometry (2001). The following measurements were taken in duplicate using calibrated equipment with the participants wearing light clothing and no shoes: standing height and weight. Height was measured to the nearest 0.1 cm using a calibrated portable stadiometer; weight was measured to the nearest 0.01 kg on a portable Seca solar scale (model 0213). The solar scale and stadiometer were calibrated before measurements using a calibration weight and steel tape, respectively. Dietary practices and socio demographic information were collected using questionnaire.

Statistical analysis

Data was analysed using the statistical package of social science (SPSS) version 23.0. Descriptive statistics were computed on the data and frequencies were used to describe categorical data. Anthropometric measurements for infants were analysed by calculating standard deviation from the median of the National Centre for Health Statistics/WHO references growth curves

(z-scores) to determine weight-for-age, length-for-age and weight-for-length variables in order to describe the birth outcomes of children. The z-scores were calculated using computer software (WHO Anthro version 2.0). Weight-for-age <-3 standard deviation (SD) is regarded as severely underweight, between -3SD to <-2SD is regarded as underweight. Pearson correlation coefficient was used to test association between variables and ANOVA was used to test significant differences within groups. A $p < 0.05$ was considered statistically significant.

Validity and reliability

The researcher used relevant literature and objectives of the study when developing the instrument to ensure validity. The questionnaire was verified by presenting it to the experts in the field of nutrition for their contribution. A pilot study was conducted to make clarity where the wording or phrasing may not be understood. Participants were allowed to ask for clarification. Participants were interviewed individually so that they each answer according to their own understanding. The results were repeated to ensure reliability, i.e. weight and length, height were repeated to ensure the accuracy of the study. Test-retest reliability helped the researcher to obtain the measure of reliability by administering the same test twice to a group of individual and then the scores from time 1 and time 2 was correlated in order to evaluate the test for stability over time.

Ethical considerations

Ethical clearance for the study was obtained from the University of Venda Research Ethics Committee (project number SHS/08/NUT/001) and the study was approved by the Provincial Department of Health Research Committee and the Department of Education. The study was performed in accordance with principles of the Declaration of Helsinki (2008), Good Clinical Practices and the laws of South Africa. A full and adequate oral and written explanation of the study was given to the participants. Respondents gave written signed consent to participate in the study. The consent form included the respondent's right to withdraw from the study and codes were used in order to ensure confidentiality of the information obtained.

Results

The results are presented in this section under following sub-readings: Socio-demographic information, maternal dietary practices and anthropometric measurements of pregnant women and their infants. Minority is explained as any percentage below 50 while majority is explained as any percentage above 50.

Table 1 shows the demographic data of the respondents in the current study. The minimum age of the participant was 15 and the maximum age was 50. Majority 187(78%) of the participants had secondary education while 47(19.5%) had tertiary education and 6(2.5%) had primary education. Furthermore, 124 (51.5%) of the participants were single while 78(32.5%) were married and 36 (15%) were living with their partners. When participants were asked about the number of family members, 153(63.6%) had a family size of 4 to 8 while 43(18%) had a family size of less than 4 and 22 (9.2%) had a family size of 8-10 and above.

	Frequency	Percentages
Age		
15-19 years	70	8.3
20-30 years	153	63.7
30-40 years	63	26.3
40-50 years	4	1.7
Educational level		
Primary education	6	2.5
Secondary education	187	78
Tertiary education	47	19.5
Marital status		
Single	124	51.5
Married	78	32.5
Divorced	1	0.5
Widow	1	0.5
Living with partner	36	15
Family size		
<4	43	18
4-8	153	63.6
8-10	22	9.2
>10	22	9.2

Table 1: Socio demographic information**.**

Table 2 illustrate the economic status of the participants, majority 185(77%) of the participants were unemployed while 55 (23%) were employed. Of all the participants that were employed 18(7.5%) were employed in the government sector while 37(15.5%) were employed in the private sector. Furthermore, the source of income for the respondents was from child support grant (36.7%), old age grant (26.7%) and spouse (24%). Furthermore, 36% of the participants indicated that their monthly household income was R1000-R2000 while 33% indicated that their monthly

household income was above R2000. However, 100 (41.7%) of the participants spend R1000-R2000 on food monthly while 88(36.7%) spent R500-R1000 on food monthly (Table 2).

Economic status	Frequency	Percentages
Employment status		
Unemployed	183	77
Employed	55	23
Types of employment		
Government	18	7.5
Private sector	37	15.5
Source of income		
Spouse	58	24
Old age grant	64	26.7
Child support grant	88	36.7
Disability grant	6	2.5
Partner s salary	3	1.3
Parents/parents in-laws	19	8
Siblings	2	0.8
Monthly household income		
<R500	32	13
RS00-1000	43	18
R1000-R2000	86	36
>R2000	79	33
Money spent on food monthly		
<R500	44	18.3
R500-R1000	88	36.7
R1000-R2000	100	41.7
>R2000	8	3.3

Table 2: Economic status of the participants.

When assessing frequency of food consumption, it was found that 129(53.7%) of the participants ate one to three times per day while 93(38.7%) ate three to six times per day. Of all starchy food consumed during pregnancy, 114(47.5%) ate porridge as their source of carbohydrates while 80(33.3%) ate rice. Furthermore, protein food consumed during pregnancy was meat and meat product 134(56%), diary product 76(32%) and legumes 30(12%). Fruits and vegetable consumed during pregnancy were bananas (41%), apples (27%), oranges (15%), mangoes (16%), pawpaw (1%), carrots (27.3%), spinach (23.3%), cabbage (18.7%), potatoes (6.7%) and beetroot (24%). However, of all the participants that indicated that they ate snacks, 25(10.3%) ate cheese-nacks while 47(19.6%) ate biscuits and 38(15.8) ate biscuits, sweets, chocolate bars, and cheese-nacks (Table 3).

Dietary practices	Frequency	Percentage
Frequency of food consumption		
1-3 times/day	129	53.7
3-6 times/day	93	38.7
7-9 times/day	18	7.6
Starchy foods consumed during pregnancy		
Rice	80	33.3
Porridge	114	47.5
Bread	26	11
Samp	20	8.2
Protein foods consumed		
Meat and Meat product	134	56
Diary product	76	32
Legumes	30	12
Fruits consumed during pregnancy		
Bananas	99	41
Apples	64	27
Oranges	35	15
Pawpaw	3	1
Mangoes	39	16
Vegetables consumed		
Carrots	66	27.3
Spinach	56	23 3
Cabbage	45	18.7
Potatoes	16	6.7
Beetroot	57	24
Delele	118	49.1
Vowa	121	50.4
Phuri	89	37.1
Snacks		
Cheesenacks	25	10.3
Biscuits	47	19.61
Hard sweets, chocolate bars and Cheesenacks	34	14
Biscuits, sweets, chocolate bars, and Cheesenacks	38	15.8
Chocolate bars, Cheesenacks, and biscuits	31	13
Cheesenacks and biscuits	65	27.3

Table 3: Dietary practices during pregnancy.

Minority 106(44.1%) of the participants did not crave for anything during pregnancy while 134(55.9%) had cravings during pregnancy. Of all the participants that had cravings 95(39.6%) craved for soil while 3(1.3%) craved for chalk and 19(8%) craved for paper. However, 17(7%) craved for ice during pregnancy (figure 1).

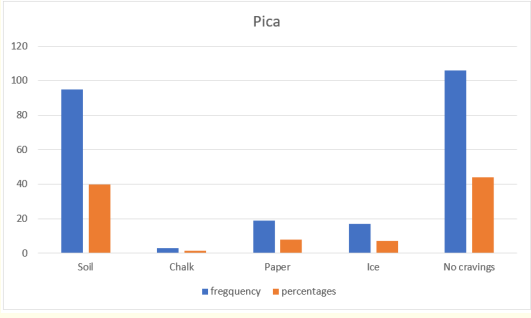

Figure 1: Craving of non-food item during pregnancy.

Of all the participants that received supplements, 126 (52.5%) of the participants received iron, folate and calcium while 114(47.5%) received folate and iron. Furthermore, all participants received supplements of on monthly basis. In addition, 201(83.7%) of the participants reported that they are taking their supplements once per day, while 34(14.3%) where taking their supplements twice per day and 5(2%) were taking their supplements three times per day. Furthermore, 123(51.3%) of the participants indicated that the reason for taking supplements is to increase blood in the body while 101 (42%) reported that the reason for taking supplements was for growth and development of the foetus and 16(6.7%) reported that the reason for taking supplements was to prevent abnormalities (NTDs). However, 194(80.8%) of the participants were taught by the nurse while 44(18.4%) where taught by the doctor and only 2(0.8%) were taught by the nutritionist/Dietician (Table 4).

Micronutrients supplementation	Frequency	Percentages
Type of supplements		
Folate and iron	114	47.5
Iron, folate and calcium	126	52.5
Duration of receiving supplements		
Monthly	240	100
Frequency of taking supplements per day		
Once	201	83.7
Twice	34	14.3
Three times	S	2
Reason for taking supplements		
To increase blood in the body	123	51.3
To prevent abnormalities (NTDs)	16	6.7
For proper growth and development	101	42
Who taught you?		
Doctors	44	18.4
Nurses	194	80.8
Nutritionist/Dietician	2	0.8

Table 4: Micronutrients supplementation during pregnancy**.**

Majority 122 (50.8%) of the participants had normal weight (18.5-24.9 kg/m^2) before pregnancy while 39 (16.3%) of the participants were underweight before pregnancy and 58(24.2%) where overweight. However, 21(8.7%) of the participants were obese. Furthermore, 102 (42.5%) of the participants had normal body weight during pregnancy while 32 (13.3%) were underweight and 91(37.9%) were obese during pregnancy. In addition, 111(46.3%) of the participants had normal BMI after birth while (12.5%) were underweight and 70 (29%) were obese after birth (Table 5).

BMI classification	Interpretation	Before N (%)	During N (%)	After N (%)
<18.5 kg/m^2	Underweight	39(16.3)	32(13.3)	30(12.5)
18.5-24.9kg/m^2	Normal	122(50.8)	102(42.5)	111(46.3)
25-29.9kg/m^2	Overweight	58(24.2)	91(37.9)	70(29)
30-39.9kg/m^2	Obese	21(8.7)	15(6.3)	29(12.2)

Table 5: Nutritional status of mother before, during and after pregnancy.

Anthropometric measurements of infants

The prevalence of underweight and mild underweight in infants was 7.9%, 22.5% respectively. However, 6(2.5%) of the infants had possible growth problems. Furthermore, 39(16.3%) of infants were stunted while 39(16.3%) were mildly stunted and 42 (17.5%) severely stunted. In addition, 26(10.8%) of infants were wasted while 69(28.8%) were mildly wasted and 7(3%) were severely wasted. In addition, 19(8%) of infants had possible risk of overweight while 26(10.8) were overweight and 1(0.4) were obese (Table 6).

Z-score classification	WAZ	LAZ	WLZ
	n (%)	n (%)	n (%)
<-3SD	0(0)	39(16.3)	7(3)
-3SD TO < -2SD	19(7.9)	39(16.3)	24(10)
-2SD to < -1SD	54(22.5)	42(17.5)	69(28.8)
-1SD to +1SD	137(57)	96(40)	94(39)
>+1SD to 5 +2SD	22(9.3)	11(4.5)	19(8)
>+2SD to 5 +3SD	6(2.5)	13(5.4)	26(10.8)
>+33D	2(0.8)	0(0)	1(0.4)

Table 6: Anthropometric indices classification of the infants.

Correlations

The mothers BMI was negatively associated with WAZ (r=-0.48; p=0.515). There was a positive association between mothers BMI and HAZ (r=0.103; p=0.158) however when mothers BMI was correlated to BAZ the association was negatively significant (r=-0.206; p=0.004). Furthermore, there is no significant difference between the employment status of the mother and Z-scores of children (WAZ (p=0.700), HAZ (p=0.553) and BAZ (p=0.728).

Health status of participants and their family members

Minority 12 (5%) of the participants were HIV positive. Furthermore, 18(17.5%) of the participants indicated diabetes as their family history conditions while 21 (8.7%) had a family history of hypertension. However, 76.5% of the participants reported that they have been cleaning during pregnancy while 43(18%) were cleaning and gardening, and 7(3%) were jogging. In addition, 6(2.5%) of the participants were cleaning and jogging during pregnancy (Table 7).

Health status	Frequency	Percentage
HIV	12	5
Family history conditions		
Diabetes mellitus	18	7.5
Hypertension	21	8.7
Physical activity		
Cleaning	184	76.5
Jogging	7	3
Cleaning and/or gardening	43	18
Cleaning and/or jogging	6	2.5

Table 7: Health status of the participants and that of their family members.

Discussion

This study is the first to provide data on the dietary practices of pregnant women, association between the mother's weight during pregnancy and their infant's weight in rural villages of South African. The finding revealed that most of the participants in the current study were very young. Adolescent often lack adequate knowledge of exactly what is needed nutritionally during pregnancy. Perhaps this could be attributed to the fact that adolescent at stage require a varied diet in order to meet the increased nutrient and energy requirements of pregnancy and support adequate weight gain. The findings revealed that majority of participants in the current study gained poor weight during pregnancy. Poor women tend to gain less weight during pregnancy, have lower micronutrient intake and this could have detrimental effects on the pregnancy outcome [5,23,24].

The findings of the study revealed that majority of the participants were unemployed. Surprisingly there is no significant difference between the employment status of the mother and Z-scores of children (WAZ (p=0.700), HAZ (p=0.553) and BAZ (p=0.728). However, women living in low socio economic status are often malnourished before pregnancy due to inadequate food intake putting them at higher risk of having low birth and preterm delivery. Nevertheless, unemployment did not affect the z-scores of the infants in the current study. These findings are congruent with previous study done in Nigeria which indicated that majority of pregnant mothers were unemployed [26]. In addition, poor weight of the pregnant women influenced by the socio-economic status of her family has a direct effect on the birth weight of her child [7]. About 41.7% of the participants in the current study spend R1000-R2000 on food while 36.7% of the participants spend R500-R1000 on food. Perhaps this variation on money spend on food could be attributed to the household income and employment status of the members of household. Studies have shown relationship between dietary diversity, socioeconomic status and demographic characteristics [21,22].

The findings of the study revealed that participants ate three meals per day. Regular meals are not expected to be skipped during pregnancy, nutritious foods are directly linked to higher chance of a normal birth weight, improving brain development and reducing the risk of many birth defects. "Post-partum outcomes for mother and infants are linked to maternal consumption habits during pregnancy [23].

In addition, one of the main meals in the current study comprised of starchy foods. Starchy foods eaten in the present study include porridge, rice, samp and bread. The findings of the current study correlate with the study done in Ethiopia [2]. "Adequate consumption of starchy food during pregnancy is known to support rapid growth of the foetus and also assist in maintaining weight gain during pregnancy" [11,25]. The participants in the current study ate meat, legumes and dairy product. "Outcome of the pregnancy depend on the mother's health. Consumption of protein food during pregnancy is vital to support growth of the foetus and this is linked to low risk of neonatal death and birth defects" [25]. These findings are congruent with study done in Nigeria were it was reported that participants ate meat and meat products including those from home owned animals [26].

The most indigenous vegetables consumed in the current study was Delele, Vowa and Phuri. Access to indigenous food has been shown to be key determinant of dietary adequacy and consumption of these food high in iron content. "Access to indigenous food has been shown to be key determinant of dietary adequacy therefore consumption of these foods is a key consideration during pregnancy" [1].

The findings of the study revealed that participants had pica during pregnancy. Consumption of non- food items in large quantities is common among pregnant women in rural villages and this could cause intestinal obstructions interfering with the absorption of essential nutrients which are vital for the growth of the foetus [26]. This is due to the fact that women lack of knowledge concerning the effects of pica on the foetus. Non-food items consumption during pregnancy can lead to malnutrition and deficiencies of vitamins and minerals. These findings are congruent with previous studies which indicated that pregnant women have been practicing pica and this can cause complication during pregnancy [9,10,24,25].

During pregnancy women are restrict to eat certain food items according to culture and this could result in fewer food consumption which in turn can lead to underweight and overweight. Surprisingly our study indicates negative correlation between mother's BMI and the infant's WAZ (r=-0.48; p=0.515). These indicate that the mother's weight during pregnancy is not only the contributing factor to infant's weight during birth. Factors such as dietary practices during pregnancy should be considered when studying the relationship between the mother's weight during pregnancy and their infants during birth. However, women who have poor weight gain during pregnancy face greater risks of delivery preterm babies and their infants set off on a weaker development path, both physically and intellectually.[25] Furthermore, Girls born with low birth weight are more likely to become poorly nourished children and poorly grown women and are, therefore, likely to give birth to low birth weight infants resulting in the vicious cycle of malnutrition [14]. In addition, nutritional status of mothers is one of the most important factors of foetal growth and development [11,23].

Prevalence of underweight and obesity during pregnancy was 13.3% and 37.9% respectively. Socio-economic disparities, poor nutritional qualities of traditional diets as well as insufficient food intake are however, considered the main causes of malnutrition in many rural communities [12]. "Obesity during pregnancy poses possible health risk both for mother and child, being obese has been shown to increase the risk of preeclampsia, gestational diabetes and congenital anomalies conditions strongly linked to foetal and infant mortality" [18]. Perhaps this can be attributed to dietary

changes that have been observed in rural South African population from low fat diet to a typical westernized high fat diet [14,21]. However, malnutrition at important stages of foetal development can also induce permanent physiological changes that result in obesity [13]. Malnutrition coexisted in the current study like in many rural communities of South Africa [14,15].

The prevalence of wasting, stunting and underweight was 10.8%, 16.3% and 7.9% respectively while 11.7% of the infants were overweight and 1.7% were obese. Furthermore, 3% of infants were severely wasted while 17.5% were stunted and 22.5% were mildly underweight. The prevalence of malnutrition may be attributed to the amount of weight the mother gained and dietary practices during pregnancy. In addition, inadequate nutrition of mothers during pregnancy can results in recurrent infections on the infant [16]. Furthermore, poor dietary practices during pregnancy contribute to poor maternal energy and micronutrients intake which result in intrauterine growth retardation and low birth weight [18,19,24,25].

Conclusion

Maternal age and dietary practices during pregnancy have a significant impact on the birth outcomes. The mother's weight during pregnancy is not the only the contributing factor to infant's weight during birth. Factors such as dietary practices during pregnancy and socioeconomic status need to be considered when studying the association between their mother's weight during pregnancy and their infants.

Recommendations

Improving nutritional status during pregnancy should follow an integrated approach tackling both malnutrition and micronutrients deficiencies at the same time considering behavioural approach which will improve child survival and maternal health. Efforts should be made to improve the antenatal care services, emphasis on maternal nutrition and the importance of proper infant and young child feeding practices for reducing malnutrition among under two children.

Acknowledgements

The authors would like to acknowledge the University of Venda and students ((Mogane H, Masidwali P, Makwarela MR) for assisting with data collection. Furthermore, we would like to pass our message of appreciation to pregnant women and their infants for their participation and cooperation.

Conflict of Interest

The researchers of this study declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' Contributions

M.T.C was responsible for project leader. M.T.C, M.L.F, M.N.S and S.A.M were responsible for the project design. S.A.M and M.T.C were responsible for data collection and drafting of the manuscript. M.N.S and M.L.F were responsible for analysis and proofreading of the manuscript.

Bibliography

1. Badi SH., *et al*. "Medical value of vegetable consumption among Berom pregnant women". *Asian Journal of medical science* 4.3 (2012): 86-88.

2. Kramer MS., *et al*. "socioeconomic disparities in pregnancy outcome: why do the poor fare so poorly?". *Pediatric Perinat epidemiol* 14.3 (2000):194-210.

3. Mostert S., *et al*. "Cultural factors affecting diet and pregnancy outcome of Mexican-American adolescents". *Current Opinion pediatrics* 13 (2005): 123-125.

4. Priyali P and Umesh K. "Role of trace elements zinc, copper and magnesium during pregnancy and its outcome". *Indian Journal of Pediatrics* 71.11 (2004): 1003-1005.

5. Skinner JD and Carruth BR. "Dietary quality of pregnant and non-pregnant adolescents". *Journal of American Diet Association* 91 (2001): 718-720.

6. Pobocik RS., *et al*. "Pregnant adolescents in Guam consume diets low in calcium and other micronutrients". *Journal of the American dietetic Association* 103.5 (2003): 611-614.

7. Hennessy E and Alberman E. "intergenerational influence affecting birth outcome: birth weight for gestational age in the children of the 1985 British Birth Cohort". *Pediatric and perinatal epidemiology* 12.1 (1998): 45-60.

8. Nyaruhucha M. "Malnutrition of under five children: evidence from Bangladesh". *Asian journal of medical science* 2 (2009): 113-118.

9. Magaret D. "effectiveness of nutrition education, iron supplementation or both on iron status in children". *Indian pediatric* 40 (2010): 1131-1144.

10. Anderson U. "Maternal serum folate and zinc concentrations and their relationship to pregnancy outcome". *American Journal Clinical Nutrition* 56 (2011): 365-370.

11. Jay S. Nutrition during maternity cycle Review article, University of Assiut, Faculty of Nursing. (2014): 18-22.

12. Gray RH. "Risk factors for pre-term and term LBW in Ahmedabad". *International Journal of Epidemiology* 21.2 (1992): 263 -272.

13. Ravelli GP., *et al*. "Obesity in young women after famine exposure in utero and early infancy". *The New England Journal of Medicine* 295.7 (1976): 349–353.

14. Zere E and McIntyre D. "Inequities in under-five child malnutrition in South Africa". *International Journal for Equity in Health* 2.1 (2003): 7.

15. Kazemi TF. "Prevalence of Overweight and Obesity in 7 to 18Year-Old Children in Birjand/ Iran". *Iranian Journal of Pediatrics* 19.2 (2009):135-140.

16. Yang Z and Huffman SL. "Review of fortified food and beverage products for pregnant and lactating women and their impact on nutritional status". *Maternal and Child Nutrition* 7.3 (2011): 19-43.

17. Tomkins A. "Nutrition and maternal morbidity and mortality". *British Journal of Nutrition* 85.S2 (2001): S93-S99.

18. Abu-Saad K and Fraser D. "Maternal nutrition and birth outcomes". *Epidemiologic Reviews* 32.1 (2010): 5-25.

19. Ali F., *et al*. "Assessment of dietary diversity and nutritional status of pregnant women in Islamabad *Pakistan". Journal of Ayub Medical College Abbottabad* 26.4 (2014): 506-509.

20. Torheim L., *et al*. "Nutrient adequacy and dietary diversity in rural Mali: association and determinants". *European Journal of Clinical Nutrition* 58.4 (2004): 594-604.

21. Savy M., *et al*. "Are dietary diversity scores related to the socioeconomic and anthropometric status of women living in an urban area in Burkina Faso?". *Public Health Nutrition* 11.2 (2008):132-141.

22. Lederman SA., *et al*. "The Effects of the World Trade Center Event on Birth Outcomes among Term Deliveries at Three Lower Manhattan Hospitals". *Environmental Health Perspectives* 112.17 (2004): 1772-1778.

23. Abu-Saad K and Fraser D. "Maternal nutrition and birth outcomes". *Epidemiologic Reviews* 32 (2010): 5-25.

24. Tsegaye D., *et al*. "Food aversions and cravings during pregnancy: prevalence and significance of maternal nutrition in Ethiopia". *Food and Nutrition Bulletin* 19.1 (2010): 20-26.

25. Mamabolo RL., *et al*. "Evaluation of the effectiveness of iron and folate supplementation during pregnancy in a rural area of Limpopo province". *South African Journal of Clinical Nutrition* 17.1 (2004): 52-98.

26. Oche MO., *et al*. "an assessment of the impact of health education on maternal knowledge and practice of childhood immunization in Kware, Sokoto State". *Journal of Public Health and Epidemiology* 3.10 (2011): 440-447.

Volume 3 Issue 7 July 2019