

Clinical Research

Dietary Assessment of Pregnant Teenagers in Tamale Metropolis

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ABSTRACT

Objective: Optimal diet is critical to nutritional status during teenage pregnancy as pregnant teenagers face serious nutritional deficits. This study was therefore aimed at exploring the many factors including dietary, which are critical in determining the nutritional status and birth outcomes of teenagers in the Tamale Metropolis.

Material and Method: A cross sectional survey of 294 pregnant teenagers in Tamale Metropolis was designed to assess food intake and food quality using Food Consumption Scores (FCS) and Dietary Diversity Scores (DDS) respectively.

Results: The mean Composite Food Consumption Score (CFCS) was 42.95 with just about half of the teenagers (51.7%) having acceptable levels of food intake based on the FAO/WFP threshold of more than 35 CFCS. The mean Individual Dietary Diversity Score (IDDS) of 10 also showed a considerably high dietary quality. The CFCS was observed to be significantly associated with caretakers' socio-demographic factors such as gender, occupation and relationship with the teenager.

Conclusions: These findings highlight the need to consider the caretakers or spouses of pregnant teenagers in designing intervention programs and policies to improve the dietary intake of pregnant teenagers for the improvement and maintenance of their nutritional status during and after pregnancy.

Keywords: Teenager, Pregnant Teenager, Nutritional Status, Dietary Assessment.

ÖZET

Tamale Metropolis'te Adölesan Gebelerde Diyet Değerlendirmesi

Amaç: Adölesan gebelik boyunca optimum diyet önemlidir ve adölesan gebeler beslenme bozuklukları ile karşı karşıya kalabilirler. Bu çalışma Tamale Metropolis'te yaşayan adölesan gebelerde diyet dahil beslenme durumu ve doğum seyrini etkileyebilecek kritik faktörleri belirlemeyi amaçlamıştır.

Gereç ve Yöntem: Bu kesitsel çalışma Tamale Metropolis'te 294 gebede gıda alımını ve gıda kalitesini değerlendirmek için sırasıyla Gıda Tüketimi Skorları (GTS) ve Diyet Çeşitlilik Skorları (DÇS) kullanılarak tasarlanmıştır.

Bulgular: Adölesanların yaklaşık yarısında (%51.7) ortalama GTS (42.95) FAO/WFP eşik değerine göre DÇS'den (35) daha kabul edilebilir düzeyde idi. Ortalama Bireysel Diyet Çeşitlilik Skoru (BDÇS) (10) ise oldukça yüksek diyet kalitesi gösterdi. BDÇS'nin, bakıcıların cinsiyeti, mesleği ve adölesana olan yakınlığı gibi sosyo-demografik faktörlerle önemli derecede ilişkili olduğu gözlemlendi.

Sonuç: Bu bulgular gebelik sırasında ve sonrasında beslenme durumunun iyileştirilmesi ve korunmasında, adölesan gebelerin diyet alımı artırmak için yapılan programları ve politikaları tasarlarlarken adölesan gebelerin bakıcıları veya eşlerinin de dikkate alınması gerektiği ihtiyacı vurgulamaktadır.

Anahtar Sözcükler: Adölesan, Gebe Adölesan, Beslenme Durumu, Diyet Değerlendirme.

Teenage pregnancy is a major public health and social problem the world over and its incidence is on the increase (1, 2). It constitutes a significant public health hazard especially in a developing country like Ghana and is a significant contributor to the present high maternal and child morbidity and mortality. The pregnant teenagers are at increased risk of pregnancy-induced hypertension, anemia, obstructed labor and its related complications (3-5). They are also three times more likely to die because of the complications of pregnancy and delivery than those aged 20-24 (6, 7). The fetuses from such pregnancies are prone to be delivered pre-term or small for gestational age and have an increased risk of perinatal death (3, 5, 6).

The nutritional and health status of a pregnant woman is an important determinant of growth and development of the fetus and child even after birth.

Dietary inadequacies during pregnancy and lack of economic resources contribute to a high neonatal morbidity and low birth weight (8) even on provision of an ideal environment and nutritional inputs (9). Maternal undernutrition leads to smaller placental size and with fewer cells available for transfer of oxygen and nutrients to the fetus, leads to lower birth weight (10). In addition, the risk of having deficiencies of iodine, folic acid and iron, which are essential during pregnancy, has serious consequences for the fetus (11).

Monotonous and inadequate diets are known to contribute to the burden of malnutrition and micronutrient deficiencies especially in developing countries (12). Despite the many approaches used to combat micronutrient malnutrition in such poor settings the problem remains unabated. However, recommendations around the world have pointed to the use of food-

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Geliş Tarihi/Received: 02.03.2015

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Kabul Tarihi/Accepted: 30.03.2016

based strategies as a most sustainable way in meeting micronutrient needs (13) and especially during pregnancy. Dietary diversification, which is an important component of the food-based approach, is critical in ensuring sustainable diets that allows the population, and especially the vulnerable groups (mainly women in reproductive age and children under five years), meet their nutrient requirements.

In Ghana, the Northern and Central Regions have the highest burden of teenage pregnancies, with about 23% of girls aged 15-19 years who have either had a live birth or are pregnant with their first child as against the national average of 13% (14). Generally, there is a disparity between urban teenagers and their rural counterparts; 11% of adolescents in urban areas have begun childbearing, compared with 16 percent of those in rural areas, representing a reduction in the urban-rural gap in teenage childbearing from 7 percent in urban areas and 22 percent in rural areas since 2003 (15). Food and nutrition security vulnerabilities are also very high in the Northern Region of Ghana (16) and the effects are borne mostly by the vulnerable poor most of who are teenagers.

Despite the many negative nutritional, health, social, and demographic consequences of teenage pregnancy, sufficient attention has not been paid in the area of scientific research to the socio-cultural and physiological factors that affect the nutritional status of pregnant teenagers, which are critical for successful outcomes of their pregnancies.

An understanding of the determinants of nutritional status among pregnant teenagers in Tamale Metropolis will go a long way to offer opportunities for formulating public health policies that would engender better recognition of the social, clinical and nutritional needs of adolescence especially during pregnancy and child-birth, in order to address them adequately.

This study was therefore aimed at exploring the many factors including dietary, which are critical in determining the nutritional status and birth outcomes of teenagers in the Tamale Metropolis.

MATERIAL and METHOD

Study Design

The design adopted for this study was a cross-sectional one to collect information from pregnant teenagers at one point in time. Pregnant teenagers were selected at the antenatal care centers in 7 suburbs of Tamale Metropolis. These suburbs were Nyohini, Bilpiela, Vitting, Sagnarigu, Choggu, Tamale central and Taha/Kamina. The choice of these centers was made as wide as possible to target both rural and urban teenagers in the Metropolis.

Sampling

The research subjects were recruited purposefully at the antenatal care centers in the Metropolis. The criterion for recruitment was based on age of respondents. Therefore, pregnant women who were in their teens

were eligible for recruitment. Ages were obtained from antenatal attendance cards which were further confirmed or verified during the interviews.

In the calculation of the sample size, a 10% of the statistically determined minimum value of 274 was added to account for none responses and sample attrition. Thus, a sample size of 299 pregnant teenagers was selected for the study.

Data Collection and Instruments

Data on food intake and socio-demographic characteristics of respondents as well as socio-demographic information of respondents' caretakers were obtained by interviews using semi-structured questionnaires. Data was also collected on other variables namely; micronutrient supplementation, gestational ages of pregnancies and diets/foods intakes from the various food groups in the population (via a food frequency questionnaire).

The food lists for drawing out the FFQ was obtained from a 24 h recall of a sample of 20 respondents who met the criteria for recruitment into the study. Those foods that were rarely consumed were removed from the food lists.

Data Analysis and Presentation

The level of food intake was analyzed using the Food Consumption Scores (FCS) indicator developed by the FAO and WFP (17). Eight different food groups; cereals and tubers, pulses, vegetables, fruits, meat and fish, dairy products, sugar and fats and oil were used to calculate the FCS. This was done by multiplying the frequency of consumption (in days) by the respective weights based on their nutrient density to obtain their consumption scores. The scores for each respondent were then summed up to obtain a total FCS as in the formula below. Their levels of food intake were then categorized using the thresholds provided by FAO.

$$FCS = a \times f(\text{cereal, and tubers}) + a \times f(\text{pulse}) + a \times f(\text{vegetables}) + a \times f(\text{fruits}) + a \times f(\text{meat and fish}) + a \times f(\text{sugar}) + a \times f(\text{diary}) + a \times f(\text{oil})$$

FCS—food consumption score

f—Average frequency of consumption (the number of days the food group is consumed within the week)

a—Weight/nutritional value of the particular food group

The levels of food intake of the respondents were obtained with the food consumption scores. The score were used to categorize levels of intake as; acceptable, borderline and poor using the WFP/FAO thresholds as shown in the table below (18). The frequency of respondents falling under each category was reported.

The dietary diversity of respondents was assessed using the Individual Dietary Diversity Score (IDDS). This score is defined as the total number of food groups consumed by an individual within a reference period (one day or a week). This indicator was used because it has been shown to have a considerably high

accuracy in measuring dietary or nutritional adequacy among adolescents (19). In line with the FAO guidelines for this indicator, the foods consumed by the respondents were grouped into one of twelve food groups (20). These groups are meats, fish, dairy products, eggs, cereals and roots, pulses and nuts, vitamin A rich vegetables, other vegetables, vitamin A rich fruits, other fruits, fats and oils and miscellaneous foods. These foods are grouped based on their nutrient qualities.

These two indicators of diet adequacy and diversity or quality were analyzed together for central tendencies such as means, mode and medians and measures of spread such as standard deviation. The confidence intervals were calculated at 95%. Spearman's correlations and linear regression were also carried out to test the relationship between the FCS and IDDS. The chi-square test was carried out on the categorical variables to establish any associations between food intake and dietary diversity. The data was analyzed using SPSS (version 16.0)

Ethical Approval

This study received prior ethical approval from the Institutional Review Board of the School of Medicine and Health Sciences of the University for Development Studies. Local approval was also sought from each of the heads of the various health centers visited. Informed consent was also obtained from each respondent.

RESULTS

Socio-demographic Characteristics of the Pregnant Teenagers

The socio-demographic characteristics of the respondents are shown in Table 1 below. Majority of the respondents (71.6%) were nineteen years old whilst a few were under 19 years old. Over half of the respondents (55.3%) had no formal education, very few (5.1%) had just primary education, about a third (31.1%) had JHS education and a few (8.5%) had SHS education. With regards to marital status, majority (64.2%) were married whilst 34.5% were never married. Only a few of the respondents were living with their partners.

Table 1. FAO Thresholds for Food Consumption Scores (FCS)

LEVEL	FCS* THRESHOLD
Acceptable intake	Above 35
Borderline intake	21 – 35
Poor intake	Below 21

Socio-Demographic Characteristics of the Caretakers of Pregnant Teenagers

Majority of the respondents (83.7%) had their caretakers being males. Most of the caretakers (63.5%) were between the ages of 26 and 35 years, a large proportion was married (80.6%) and had no formal education (70.3%) at all. For those with some form of formal

education, majority had the most basic form of formal education (Table 2).

The Socio-Economic Status of the Caretakers

Most of the caretakers (87.6%) were informally employed whilst just about 3.4% and 8.3% were formally employed and unemployed respectively (Table 3). More than half (59.9%) of the respondent were being taken care of by their husbands, and more than a third (35%) by their parents. The others were taken care of by other relations as shown in (Table 4).

The Levels of Dietary Intake of the Pregnant Teenagers

Weekly Pattern of Dietary Intake

Staples (cereals, grains roots and tubers) were the highly consumed food group with a mean weekly frequency of consumption of 5.0 days. This was followed by fat and oils and sugars which had their mean weekly frequency of consumptions to be about 5 and 4 days respectively. The least consumed food groups were vegetables and fruits which both had equal mean weekly frequency of consumption (2 days). This is further shown in (Table 5).

Levels of Food Intake

The mean composite FCS was 42.95. With respect to the levels of food intake based on the composite FCS, about half (51.7%) of respondents had acceptable levels whilst 27.2% and 21.1% were borderline and poor levels respectively (Figure 1).

The Dietary Quality of the Pregnant Teenagers

For the purpose of dietary diversity or quality, the staples again appeared to be highly consumed with a weekly mean of 6 days per week. Meats, pulses and nuts, other vegetables, vitamin A rich vegetables, vitamin A rich fruits and other fruits had comparable levels of consumption with a weekly mean of 3 days. Fish was the least consumed food group with a weekly mean of 1 day. The details are presented in (Table 6).

Individual Dietary Diversity Scores (IDDS)

The mean IDDS was 10.0 with a standard. The minimum IDD score of 7 was obtained by 10.2% of respondents and the maximum IDD score of 12 was obtained by 19.5% of respondents. Most of the respondents (32.7%) had Individual Dietary Diversity Scores of 11 (Figure 2)

The Relationship between Socio-Demographic Characteristics and Dietary Intake

None of the socio-demographic variables of the teenagers had any significant association with their dietary intake (both the levels of food intake and IDDS). Among all the socio-demographic variables of the caretakers, their gender, relationship with the respondents and occupation had significant associations with the level of food intake. However, none of the variables were associated with the IDDS.

Table 2. Socio-Demographic Characteristics of the Teenagers and their Caretakers

Teenagers		Caretakers	
Variable	Percent (%)	Variable	Percent (%)
Age (years)		Sex	
16	1.4	Male	83.7
17	7.7	Female	16.3
18	19.3	Total	100
19	71.6	Age (years)	
Total	100	Under 20	1.5
Level of Education		21 – 25	10.6
None	55.3	26 – 30	31.6
Primary	5.1	31 - 35	31.9
JHS	31.1	36 – 40	6.8
SHS	8.5	above 40	17.5
Total	100	Total	100
Marital Status		Level of education	
Married	64.2	None	70.5
never married	34.5	Primary	17.5
Cohabitation	1.4	JHS	8.6
Total	100	SHS	1.9
Term of Pregnancy		Tertiary	1.5
First Trimester	14.8	Total	100
Second Trimester	52.6	Marital Status	
Third Trimester	32.6	Married	80.6
Total	100.0	never married	18.8
		Divorced	0.7
		Total	100

Table 3. Occupation of Caretakers

Occupation	Percent (%)
Informally employed	87.6
Formally employed	3.4
Unemployed	8.3
Others	0.7
Total	100

Table 4. Relationship of the Teenagers with their Caretakers

Relation	Percent (%)
Parent	35.0
Husband`	59.9
Sister	3.4
Mother-in-law	1.0
Aunt	0.3
Partner	0.3
Total	100

Table 5. Descriptive Statistics for weekly food consumption and the Composite FCS

Food Group	N	Min.	Max.	Mean ± SD
Meats and Fish	294	0	6	2 ± 1
Dairy Products	294	0	7	3 ± 2
Staples	294	5	7	6 ± 1
Pulses and Nuts	292	0	7	2 ± 2
Vegetables	294	0	6	2 ± 2
Fruits	294	0	7	2 ± 2
Fats and Oils	294	3	7	5 ± 1
Sugars	294	3	7	4 ± 2
Composite Food Consumption Scores (CFCS)	294	11	77.39	43.0 ± 15.6

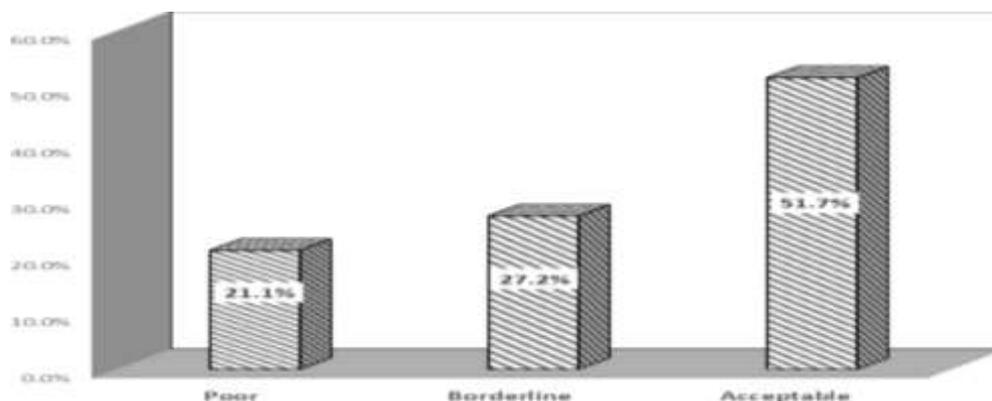


Figure 1. Levels of food intake

Table 6. Descriptive Statistics for Dietary Diversity

Food Groups	N	Min.	Max.	Mean ± SD
Meats	294	0	7	3 ± 2
Fish	294	0	7	1 ± 1
Dairy	294	0	7	2 ± 2
Eggs	294	0	7	2 ± 2
Cereals and Roots	294	5	7	6 ± 1
Pulses and Nuts	294	0	4	3 ± 1
Other Vegetables	294	0	6	3 ± 1
Vitamin A rich Vegetables	294	0	6	3 ± 1
Vitamin A rich Fruits	294	0	6	3 ± 1
Other Fruits	294	0	6	3 ± 1
Fats and Oils	294	3	7	5 ± 2
Miscellaneous	294	0	5	3 ± 1
IDDS	294	7	12	10 ± 2

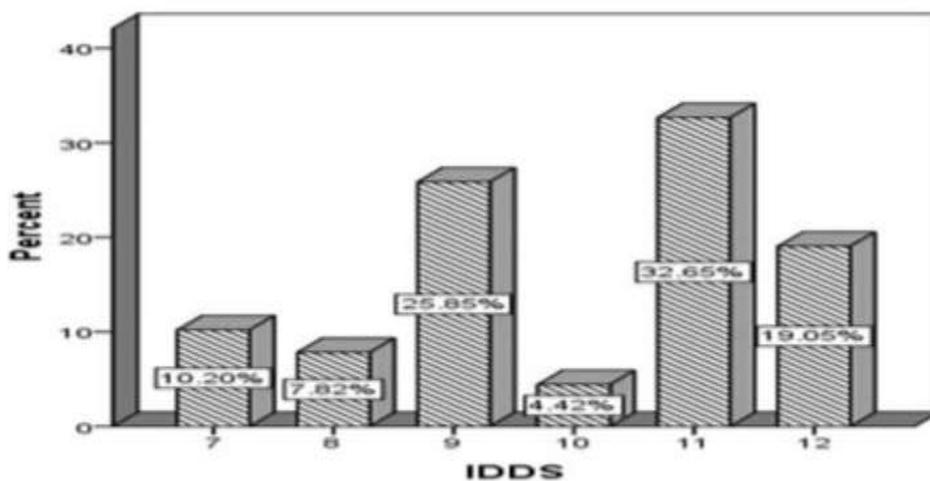


Figure 2. Frequency of Individual Dietary Diversity Scores (IDDS)

Table 7. Significant associations of some socio-demographic variables with level of food intake

Variable	chi-square value	Df	P-value (2-tailed)
Gender of Caretakers	8.278	3	0.041
Relationship with caretaker	51.192	18	0.000
Occupation of caretaker	104.506	63	0.001
Term of Pregnancy	14.356	6	0.026

DISCUSSION

Socio-Demographic Background of the Teenagers and Their Caretakers

About half of the pregnant teenagers were in the third trimester of their pregnancy which could result from the fact that the study was carried out at ANC outlets where pregnant women in developing countries are known to normally book late (11). The high proportion of those without education could be due to the fact that

most of the respondents were coming from the surrounding rural communities in the metropolis where formal education is usually a challenge. This result is consistent with other studies that have reported the level of education to be negatively associated to the prevalence of teenage pregnancy (11, 15). About two-thirds of respondents (64.2%) were married, which is also consistent with several research findings including the UNICEF-sponsored International Planned Parenthood Federation (IPPF) report on child marriage (21).

As shown in Table 1, many of the caretakers were between their late 20s to early 30s and were mostly males (83.7%) because most of the teenagers were married and were living with their husbands. Again, many of the caretakers (70.3%) had no education which further confirms the findings that education of the spouses and not only that of the teenager could have a negative effect on the occurrence of teenage pregnancies since those who are not in school tend to marry earlier than their literate counterparts (22). Almost all the caretakers (87.0%) were in informal employment (Table 3).

Dietary Intake of the Pregnant Teenagers

Among all the eight food groups, which were used to estimate the levels of food intake with the Food Consumption Scores (FCS), staples (cereal grains, roots and tubers) were the highly consumed food group with a mean weekly frequency of 6 days. This was followed by Fats and sugars, with 5 and 4 days per week respectively as their mean weekly frequencies of intake, were the next mostly consumed food groups. The least consumed food groups were vegetables and fruits (Table 5). This pattern is consistent with dietary patterns of populations in developing countries which are mainly composed of staples and energy dense food groups (fats and oil) and a limited quantity of animal products and fresh fruits and vegetables (23, 24). This presents a risk of deficiencies or excesses of several micro or macronutrients (25). The low consumption of fruits and vegetables as well as meat and fish presents a nutritional concern especially with respect to micronutrient adequacy of their diet, as these nutrients are essential during pregnancy especially among teenagers.

The mean Composite Food Consumption Score (CFCS) was 42.9, which is at the extreme lower end for the acceptable level of intake. Despite this lower mean CFCS, about half of the teenagers (51.7%) had an acceptable level of food intake based on the FAO/WFP CFCS thresholds. Not much difference was observed in the proportions at borderline (27.2%) and unacceptable (21.1%) levels of food intake (Figure 1).

Dietary Quality of the Pregnant Teenagers

With regard to the quality of diet which was measured with the IDDS, it was observed that out of a total of 12 food groups, the respondents consumed averagely from 10 different food groups (Table 6). This means that generally the respondents had good quality diet because previous studies have reported dietary diversity as an important element of a high quality diet (26, 27).

They therefore have a greater probability of meeting their energy and micronutrient requirements as Dietary Diversity Score have been reported by many studies to be correlated positively with energy and micronutrient intake (28-32).

The Effects of the Socio-Demographic and Economic Factors on the Dietary Intake

Among all the socio-demographic variables of the teenagers, none except the term of their pregnancies, had significant associations with their level of food intake (Figure 2 and Table 7). This association could be explained by the fact that these teenagers are mainly dependent on their caretakers and as such obtained their food from them. Those in their second trimester had highest proportion of those with acceptable intake. This could be due to the aversions and other non-diet friendly symptoms of early pregnancy such as nausea and appetite loss that often affect food intake during the first trimester (33). Also, within this period, the teenager is still in a transition from her normal life to life during pregnancy and as such the nutritional support offered to her due to the pregnancy is yet to start (11, 34, 35).

The significant associations observed between gender of the caretakers and their relationship with the respondents (Table 7) could be due to the fact most of them were married and thus were staying with their husbands. Occupational status that was used as a measure of economic status of the caretakers was also significantly associated with levels of food intake. This is consistent with the age-old literature that occupation is associated positively with economic food acquisition or accessibility of households or individuals (36, 37). Even though the overall food consumption and dietary diversity or quality of the pregnant teenagers was acceptably high, a considerable proportion still fell within both the poor and borderline food consumption categories intake. The food consumption was observed to be significantly associated with the caretakers' socio-demographic factors such as gender, relationship with the teenager and occupation.

These findings highlight the need consider the caretakers or spouses of pregnant teenagers in designing intervention programs and policies to improve the dietary intake of pregnant teenagers for the improvement and maintenance of their nutritional status during and after pregnancy. These programs and policies will go a long way to reduce the contribution of teenage pregnancy on maternal and infant mortalities and morbidities in the metropolis and the country and beyond.

REFERENCES

1. Aboyeji AP. Obstetric outcome of teenage primigravidae in Ilorin. *Niger Med J* 1997; 33: 56-9.
2. Ademuyiwa MO, Sanni SA. Consumption pattern and dietary practices of pregnant women in Odeda Local Government Area of Ogun State. *Int J Biol Vet Agric Food Eng* 2013; 7: 1049-53.
3. Allen L. To what extent can food-based approaches improve micronutrient status? *Asia Pac J Clin Nutr* 2008; 17: 103-5.
4. Arimond M, Wiesmann D, Becquey E, *et al.* Simple food group diversity indicators predict micronutrient adequacy of women's diets in 5 diverse, resource-poor settings. *J Nutr* 2010; 140: 2059-69.
5. Boyd A. *The World's Youth 2000. Population Reference Bureau; Washington DC: Measure Communications, 1999.*
6. Christina CL, Grace KL, Linda SL, James HL. Pregnancy hormone metabolite patterns, pregnancy symptoms, and coffee consumption; *Am J Epidemiol* 2002; 156: 428-37.
7. Dina L. *Dietary Diversity and Nutrient Adequacy in Women of Childbearing Age in a Senegalese Peri-urban Community. School of Dietetics and Human Nutrition, McGill University, Montreal, Canada. 2004.*
8. FAO. *Guidelines for Measuring Household and Individual Dietary Diversity. Food and Agriculture Organization of the United Nations, Rome, Italy, 2011.*
9. Ghana Statistical Service (GSS). *Ghana Health Service (GHS) and ICF Macro. Ghana Demographic and Health Survey 2008. Accra, Ghana: GSS, GHS, and ICF Macro 2009; FR221; 147-78.*
10. Gina K, Maylis R, Terri B, Marie CD. *Measurement of Dietary Diversity for Monitoring the Impact of Food Based Approaches; Produced as Part of the Published Proceedings of the International Symposium on Food and Nutrition Security: Food-Based Approaches for Improving Diets and Raising Levels of Nutrition. Rome, Italy 2010.*
11. Gross K, Alba S, Glass TR, Schellenberg JA, Obrist B. *Timing of antenatal care for adolescent and adult pregnant women in south-eastern Tanzania. BMC Pregnancy Childbirth* 2012; 12: 6.
12. Konttinen H, Sarlio-Lähteenkorva S, Silventoinen K, Männistö S, Haukkala A. *Socio-economic disparities in the consumption of vegetables, fruit and energy-dense foods: the role of motive priorities. Public Health Nutr* 2013; 16: 873-82.
13. Hatloy A, Torheim L, Oshaug A. *Food variety-a good indicator of nutritional adequacy of the diet? A case study from an urban area in Mali, West Africa. Eur J Clin Nutr* 1998; 52: 891-8.
14. Hoddinott J, Yohannes Y. *Dietary diversity as a food security indicator. Food and Nutrition Technical Assistance Project (FANTA). Washington, D.C: Academy for Educational Development, 2002.*
15. *International Planned Parenthood Federation and Global Coalition on Women and AIDS. Ending Child Marriage: A Guide for Global Policy Action 2007. London: Portfolio Publishing, 2007.*
16. Johns T. *Plant biodiversity and malnutrition: Simple solutions to complex problems. Afr J Food Agr Nutr Dev* 2003; 3: 45-52.
17. Jyothilakshmi A, Prakash J. *Maternal characteristics and nutritional and health status of rural children; an overview. Ind J Nutr Diet* 2004; 41: 30-7.
18. Khanna S, Chand S, Singla PN, Agarwal KN. *Morphological study of placenta in pregnancy anemia. Ind J Pathol Microbiol* 1979; 22: 7-12.
19. Madeline Z. *The effect of partners' characteristics on teenage pregnancy and its resolution. Fam Plann Perspect* 2001; 33: 192-9.
20. Magadi MA, Agwanda AO, Obare FO. *A comparative analysis of the use of maternal health services between teenagers and older mothers in sub-Saharan Africa: evidence from Demographic and Health Surveys (DHS) 2006. Soc Sci Med* 2007; 64: 1311-25.
21. Mirmiran P, Azadbakht L, Azizi F. *Dietary diversity among food groups: an indicator of specific nutrient adequacy in Tehranian women. J Am Coll Nutr* 2006; 25: 354-61.
22. Mirmiran P, Azadbakht L, Esmailzadeh A, Azizi F. *Dietary diversity score in adolescents- a good indicator of the nutritional adequacy of diets: Tehran lipid and glucose study. Asia Pac J Clin Nutr* 2004; 13: 56-60.
23. Ojengbede OA, Otolorin EO, Fabanwo AO. *Pregnancy performance of Nigerian women aged 16 years and below. Afr J Med Sci* 1987; 16: 89-95.
24. Okpani AOU, Ikimalo J, John CT and Briggs ND. *Teenage Pregnancy. Trop J Obstet Gynaecol* 1995; 12: 34-6.

25. Roy S, Motghare DD, Ferreira AM, Vaz FS, Kulkarni MS. Maternal determinants of low birth-weight at a tertiary care hospital. *J Fam Welfare*; 2009; 55: 79-83.
26. Steyn NP, Nel JH, Nantel G, Kennedy G, Labadarios D. Food variety and dietary diversity scores in children: are they good indicators of dietary adequacy? *Public Health Nutr* 2006; 9: 644-50.
27. Tontisirin K, Nantel G and Bhattacharjee L. Food-based strategies to meet the challenges of micronutrient malnutrition in the developing world. *Proc Nutr Soc* 2002; 61: 243-50.
28. Tucker K. Eat a variety of healthful foods: old advice with new support. *Nutr Rev* 2001; 59; 156-8.
29. United Nations Children's Fund (UNICEF). Strategies of improving nutrition of children and women in developing countries; New York: UNICEF, 1990.
30. United Nations Population Fund. Fast Sheet: Young people and Demographic Trends. New York: UNFPA 2000.
31. Uwaezuoke IO, Uzochukwu SC, Nwagbo FE, Onwujekwe OE. Determinants of Teenage Pregnancy in Rural Communities of Abia State, South East Nigeria. *J Coll Med* 2004; 9: 28-33.
32. WFP. Ghana Food Security and Vulnerability Analysis; United Nations, WFP Headquarters, via C.G. Viola 68, Parco de' Medici, 00148, Rome, Italy 2012.
33. WFP and FAO. Measures of Food Consumption - Harmonizing Methodologies; Interagency Workshop Report; Rome, 2008.
34. WHO. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. Technical Report Series No.854. Geneva, 1995: 460.
35. WHO. Adolescent Pregnancy (Issues in Adolescent Health and Development). WHO Discussion Papers On Adolescence; Department of Child and Adolescent Health and Development. Geneva. World Health Organization, 2004.
36. World Food Program. Comprehensive Food Security & Vulnerability Analysis Guidelines. Rome: United Nations World Food Program, 2009.