

Maternal weight gain and pregnancy outcome in adolescent girls in Ibadan, Nigeria

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Summary

Background: Maternal weight gain is an important predictor of pregnancy outcome. Pregnancy in adolescence is a major health challenge because it is associated with high risk. Few studies have been carried out on the influence of weight gain in adolescent pregnancy outcome in Nigeria.

Objective: This study determines the influence of maternal weight gain on the pregnancy outcome of adolescent mothers in Ibadan, Oyo state, Nigeria.

Materials and Methods: A retrospective review of case notes of 785 adolescents ≤ 19 years and 1300 adult mothers who delivered at Adeoyo and Oluyoro maternity hospitals from January 2003 to December 2006 was carried out. Anthropometric information such as weight at second and third trimester, and infant birth weight and length were collected using a record review proforma. The data were analyzed using chi-square, ANOVA, Pearson's and Spearman's correlation.

Results: Adolescent mothers had a significantly lower weight gain (6.1 ± 2.9 kg) compared to the control whose mean weight gain was 6.7 ± 3.6 kg ($p < 0.05$). There was also a significant difference in the proportion of the adolescent mothers (77.3%) and the adult mothers (57.6%) with packed cell volume below normal levels ($p < 0.05$). The mean infant birth weight and length among adolescents (2.8 ± 0.5 kg and 46.6 ± 4.0 cm) were significantly lower than 3.1 ± 0.5 kg and 47.9 ± 3.5 cm of adult mothers respectively ($p < 0.05$). The prevalence of low birth weight was significantly higher among the adolescent mothers (12.2%) than in the adult mothers (7.9%) ($p < 0.05$). A significant positive relationship was found between infant birth weight and maternal weight gain in pregnancy ($r_s = 0.18$, $p < 0.05$). Caesarean section was significantly higher among adolescent mothers (21.0%) than adult mothers (10.7%) ($p < 0.05$). Complications of pregnancy were more common among adolescent mothers (35.8%) than adult mothers (15.5%).

Conclusion: The adolescent mothers had significantly lower weight gain in pregnancy and higher rates of low

birth weight compared to the adult mothers ($p < 0.05$). Strategies to reduce incidence of adolescent pregnancies and improve access to nutrition information that will promote weight gain among pregnant adolescents should be instituted.

Keywords: Maternal weight gain, adolescent pregnancy, pregnancy outcome, infant birth weight.

Résumé

L'augmentation du poids maternel est un prédicteur important de résultat de la grossesse. La grossesse chez les adolescents est un défi de santé majeur vu le risque élevé. Certaines études ont été faite sur l'influence du poids dur la grossesse chez les adolescents au Nigeria. Cette étude rétrospective avait pour but de déterminer l'influence du gain de poids maternel sur le résultat de la grossesse des registres de 785 mères adolescent de d'19 ans et 1300 mères adultes qui accouchaient dans les maternités de l'hôpital d'Adeoyo et Oluyoro à Ibadan, état d'Oyo, Nigeria de Janvier 2003 à Décembre 2006. Les informations anthropométriques telles que le poids au second et troisième trimestre, le poids et la taille de l'enfant à la naissance étaient prise en utilisant un format préforma. Les données étaient analysées utilisant le chi-square, ANOVA, les corrélations de Pearson et Spearman. Les mères adolescent avaient un gain de poids significativement (6.1 ± 2.9 kg) comparable aux contrôles qui avaient un gain de poids moyen de 6.7 ± 3.6 kg ($p < 0.05$). Il y avait une différence significative dans les proportions des mères adolescent (77.3%) et les mères adultes (57.6%) avec des taux de sang en dessous des taux normaux. Le poids et la taille moyen de l'enfant a la naissance chez les mères adolescent de (2.8 ± 0.5 kg et 46.6 ± 4.0 cm) étaient significativement plus bas que 3.1 ± 0.5 kg et 47.9 ± 3.5 cm chez les mères adultes respectivement ($p < 0.05$). La prévalence des poids bas a la naissance était significativement plus élevé parmi les mères adolescents (12.2%) que les mères

adultes (7.9%) ($p < 0.05$). Une relation significative et positive était observée entre le poids de l'enfant à la naissance et le gain de poids maternel en grossesse ($r_s = 0.18$, $p < 0.05$). La scission Césarienne était plus fréquente parmi les mères adolescentes (21.0%) que les mères adultes (10.7%) ($p < 0.05$). Les complications de la grossesse étaient plus communes parmi les mères adolescentes (35.8%) que les mères adultes (15.5%). Les mères adolescentes étaient significativement un gain faible de poids pendant la grossesse et les taux les plus élevés de faible poids à la naissance comparés aux mères adultes ($p < 0.05$). Les stratégies doivent être instituées pour réduire l'incidence des grossesses chez les adolescentes et améliorer l'accès à l'information nutritionnelle qui promettra un gain de poids parmi les mères adolescentes.

Introduction

Pregnancy during adolescence carries more risk than among older women. This is because teenage girls are physically and psychologically immature for reproduction [1,2]. In addition, there are some extrinsic factors such as inadequate prenatal care, illiteracy, and poor socio-economic conditions which affect the outcome of pregnancy in the teenage girl [1]. Also, adolescents may enter pregnancy with poor nutritional status and low storage of nutrients. Furthermore, until adolescent development is completed, competition for nutrients between mother and fetus may have adverse consequences on both the mother and the child [3]. Improving the nutritional status of adolescent pregnant girls through adequate feeding may not have a significant effect on the birth weight of their babies, as it appears that the extra nutrients are diverted for maternal growth, at the expense of fetal growth [3].

Nigeria is among the developing countries with high maternal and infant morbidity and mortality rates. One of the major factors contributing to the high maternal and infant morbidity in Nigeria is adolescent pregnancy. Few programs exist in Nigeria to specifically target adolescent malnutrition and hence, their pregnancy outcomes and infant survival.

Studies have demonstrated that increase in maternal weight gain of adult pregnant women has led to increase in weight of their infant at birth [4,5]. This study determines the pattern of the weight gain of pregnant adolescent women compared to adult mothers in Ibadan, Oyo state, Nigeria.

Materials and methods

The study was a retrospective review of two thousand and eighty five (2,085) hospital records of pregnant

adolescent mothers (age 10-19 years) and adult mothers (age 20 and above) who delivered live born singleton infants at 37th weeks or more gestation, in a private and public health facilities in Ibadan, Oyo state, Nigeria, between January 2003 and December 2006. A total number of 785 case files of adolescent mothers and 1300 case files of adult mothers were examined and the required information was extracted. The study sample was restricted to women with singleton pregnancies, whose pregnancies lasted ≥ 37 weeks to limit the effects of early delivery on the relationship of pregnancy weight gain and newborn size. Women with the history of diabetes mellitus were excluded from the study. The preconception weights of the mothers were not available in the hospital record. Also, only the records of the women in the second to the end of the third trimester (13th to ≥ 37 th weeks) of pregnancy were considered in this study because of the poor attendance of the women at the antenatal clinics within the first trimester. The weeks included in the second and third trimesters consisted of the 13th to the 25th weeks for the second trimester and >25 th to 37th week or more (last week of delivery) for the third trimester. The total weight gain of the mothers from the second to the third trimester were recorded as the weight gain from the 13th to ≥ 37 th (last) week to delivery. The extracted information from the mothers records included; the socio-demographic characteristics, parity (number of previous life births), anthropometric data of height and also the weight of the mothers from the second to the end of the third trimester (from the 13th to the ≥ 37 th last week of delivery) and data of laboratory examinations such as Packed Cell Volume (PCV) to determine the incidence of anaemia. Information on the pregnancy outcomes such as obstetric complications, type of delivery and the birth weight and length of infants were also extracted from the mothers' hospital files.

The data generated were subjected to statistical analysis using SPSS version 12.0. The data were analyzed using means, standard deviations, chi-square, ANOVA, Pearson's and spearman correlation as appropriate. A Multiple Regression Analysis was also conducted to determine the factors influencing infant weight at birth.

Results

The socio-demographic characteristics of the pregnant women

The socio-demographic profile of the pregnant women is presented in Table 1. The age of the adolescent pregnant women ranged from 14-19 years with a mean

Table 1: Socio-demographic characteristics of the pregnant women (n=785 adolescents and 1300 adult pregnant women)

	Adolescent women n (%)	Adult women n (%)	Total n (%)	P Value
<i>Marital status</i>				
Single	72 (9.2)	8 (0.6)	80 (3.9)	(p<0.05)
Married	713 (90.8)	1292 (99.4)	2005 (96.1)	
<i>Religion</i>				
Islam	571 (72.7)	686 (52.8)	1257 (60.3)	(p<0.05)
Christian	214 (27.3)	614 (47.2)	828 (39.7)	
<i>Ethnic group</i>				
Yoruba	750(95.5)	1200(92.3)	1950(93.5)	
Igbo	11(1.5)	73(5.6)	84(4.0)	(p<0.05)
Hausa	11(1.4)	5(0.4)	16(0.8)	
Others (Edo, Igbira)	13(1.6)	22(1.7)	35(1.7)	
<i>Occupation</i>				
Students	260(33.1)	103(7.9)	363(17.4)	
Full housewives	81(10.3)	39(3.0)	120(5.8)	
Petty trader	287(36.6)	683(52.5)	970(46.5)	(p<0.05)
Artisans	149(19.0)	255(19.6)	404(19.4)	
Civil Servants	8(1.0)	220(16.9)	228(10.9)	
<i>Parity</i>				
0	718(91.3)	281(21.6)	999(47.9)	
1	61(7.7)	305(23.5)	366(17.6)	
2	6(0.9)	376(28.6)	382(18.3)	(p<0.05)
3	0(0.0)	184(14.2)	184(8.8)	
≥4	0(0.0)	154(11.8)	154(7.4)	
<i>Had access to regular antenatal care</i>				
Yes	588(74.9)	1274(98.0)	1862(89.3)	(p<0.05)
No	197(25.1)	26(2.0)	223(10.7)	

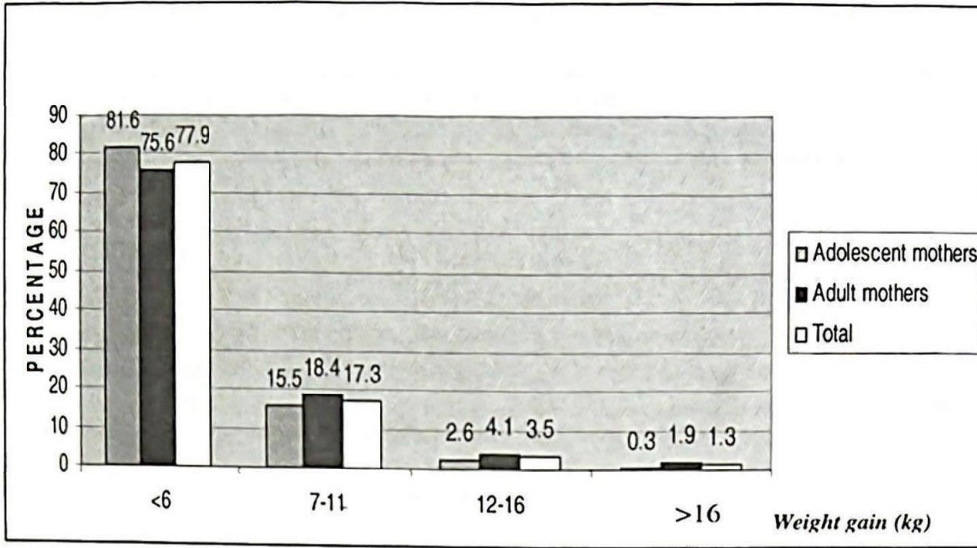
age of 18.0 ± 1.1 years, while the age of the adult pregnant women ranged from 20-45 years with a mean age of 28.2 ± 5.1 years. Majority 2005 (96.1%) of the pregnant women were married. However, a higher proportion 72(9.2%) of the adolescent pregnant women compared with the adult pregnant women 8(0.6%) were not married. There were more Muslims 1257(60.3%) than Christians 828(39.7%). A large number of the adolescent pregnant women 571(72.7%) were also Muslims. The pregnant women were predominantly Yoruba. Only a few 135(6.5%) of all the women were Igbo, Hausa or other tribes (Edo, Igbira). The main occupation of the pregnant women was petty trading. About a third 260(33.1%) of the adolescent pregnant women were students while 81(10.3%) were full housewives. Very few of the adolescent pregnant women 8(1.0%) were civil servants. The majority 718(91.3%) of the adolescent pregnant mothers were primiparous while 1019(79.4%) of the adult mothers were multiparous. All the mothers included in the study had singleton

pregnancy and a significantly higher percentage 197(25.1%) of the adolescent pregnant women compared to the 26(2.0%) adult pregnant women who did not attend antenatal clinic regularly (p<0.05).

Anthropometric characteristics of the pregnant women

The range and mean heights of the adolescent pregnant women (130cm-180cm and 155.5 ± 6.4 cm) were significantly lower than 132-195cm and 156.0 ± 7.3 cm for adult pregnant women (p<0.05). The adolescent pregnant women had significantly lower mean weight at the beginning of the second and the end of third trimester (52.4 ± 6.5 kg and 58.4 ± 7.1 kg compared with the 61.9 ± 11.7 kg and 68.6 ± 11.9 kg of the adult pregnant women respectively (p<0.05).

The mean pregnancy weight gained (6.01kg Vs 6.76kg) by the adolescent pregnant women (mostly primiparous) and the adult pregnant women (mostly multiparous) from the beginning of the second to the end of the third trimesters were significantly different



Weight gain = Weight gained from 13th - ≥ 37th last week of delivery

Fig. 1: The Distribution of the pregnant women according to their weight gain from the second to the third trimesters of pregnancy.

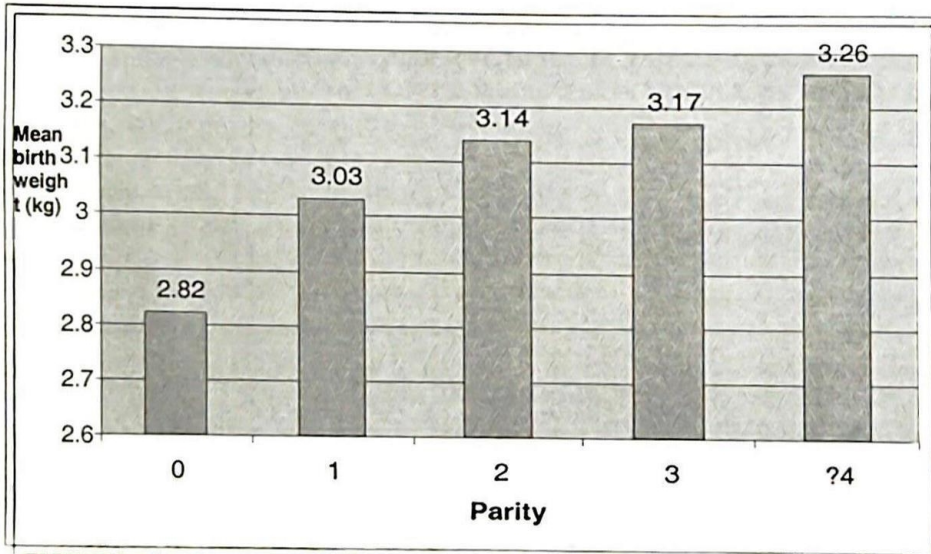


Fig.2: The mean infant birth weight (Kg) and parity of the mothers

($p < 0.05$). Figure 1 shows the distribution of the pregnancy weight gain (from the 13th - ≥ 37th (last week of delivery) of the pregnant women. Most 1624(77.9%) of the pregnant women's weight gain at the end of the third trimester was below 6.0kg. Only 459(22.1%) of all the women gained weight above 6.0kg. A higher proportion, 641(81.6%) of the adolescent pregnant women compared with 983(75.6%) of the adult pregnant women had pregnancy weight gain below 6.0kg ($p < 0.05$). The proportion of adult pregnant women (24.4%) who gained weight above 6.0kg at the end of the third trimester was significantly greater compared with 18.4% of the

adolescent pregnant women ($p < 0.05$). The weight gain of the pregnant women in the third trimester according to their parity is shown in Table 2. The nulliparous pregnant women had the lowest weight gain in pregnancy of 6.0kg and 6.6kg in adolescent and adult pregnant women respectively. Weight gain in pregnancy increased in all the women with parity. However, the weight gain between the second and the third trimester was greater in the adult (6.7kg) compared with the weight gain of 6.0kg in the adolescent women ($p < 0.05$). It is shown in figure 2, that the mean birth weight of the infants was

Table 2: The weight gain of the women between the second and the third trimester of pregnancy according to their parity

Parity	Mean weight gain (Kg)		
	Adolescent	Adult	
0	6.0	6.5	
1	6.1	6.7	
2	6.2	6.8	P<0.05
3	-	6.9	
≥4	-	6.9	
Total	6.0	6.7	

lowest (2.8kg) among the nulliparous pregnant women and higher with increase in parity among the multiparous pregnant women. The infant birth weight was positively and significantly related with the

Table 3: The mean weight gain and the birth weight of the infants according to the age of the mothers

Mother's Age (Years)	Mean Weight gain (kg)	Mean Birth Weight (kg)
≤19	6.1	2.8
20 – 24	6.6	2.9
25 – 29	6.9	3.1
30 – 34	6.5	3.2
35 – 39	6.8	3.0
Above 40	6.3	3.2
Total	6.5	3.0

weight gain of the pregnant women ($r=0.19$; $p<0.001$ for adolescent mothers, $r=0.15$; $p<0.001$ for adult women, $r=0.18$; $p<0.001$ for all the women). Maternal weight gain and infant birth weight increased with parity.

The mean weight gain and the mean birth weight of the infants according to the age of the mothers is presented in table 3. Adolescent pregnant women had the lowest (6.1kg) weight gain from the second to the third trimester and also delivered infants with the lowest birth weight (2.8kg). The birth weight of the infants increased with increase in age until the age of 34 after which the birth weight of the infants decreased.

Complications in pregnancy

As shown in table 4, a high percentage 1601(76.8%) of the pregnant women had no complication. However, complications in pregnancy were significantly greater among the adolescent 281(35.8%) than in the adult 202(15.5%) pregnant women ($p<0.05$).

Complications such as eclampsia, fetal distress, retained placenta and cervical dystocia were more common in adolescent pregnant women than in the adult pregnant women. The prevalence of eclampsia was significantly higher in the adolescent pregnant women 246(31.3%) compared to the adult pregnant women 278(21.4%). ($p<0.05$).

Table 4: The Incidence of Complication among The Pregnant Women and Foetal Outcome

Had complication in pregnancy	Adolescent women n = 785 n %	Adult women n = 1300 n %	Total n = 2085 n %	P-Value
Yes	281 (35.8)	202 (15.5)	484 (23.2)	p<0.05
No	504 (64.2)	1099 (84.5)	1601 (76.8)	
<i>Types of complication</i>				
Anaemia	607 (77.3)	749 (57.6)	1355 (65.0)	p<0.05
Eclampsia	246 (31.3)	278 (21.4)	524 (25.2)	
Fetal distress	424 (54.0)	598 (46.0)	1022 (49.0)	p<0.05
Retained placenta	56 (7.1)	82 (6.3)	138 (6.5)	
Cervical dystocia	168 (21.4)	63 (4.8)	231 (11.0)	
<i>Fetal outcome</i>				
Normal birth	608 (77.4)	1171 (90.1)	1779 (85.4)	p<0.05
Low birth weight	96 (12.2)	103 (7.9)	199 (9.5)	
Still birth	60 (7.6)	22 (1.7)	82 (3.9)	
Prematurity	22 (2.8)	4 (0.3)	26 (1.2)	

The incidence of anaemia amongst the pregnant women

In this study, the incidence of anaemia was significantly higher in the adolescents (77.3%) than the adult pregnant women (57.6%) ($p < 0.05$). Anaemia was also significantly prevalent 739 (74.0%) in the primiparous women (of which most adolescent pregnant women belonged) than the multi-parous ones ($p < 0.05$). A decrease in the incidence of anaemia was observed in the pregnant women as parity increased. However, there was a slight increase in the incidence of anaemia among the women with parity ≥ 4 .

The effects of pregnancy outcomes on the infants

Although majority 1781 (85.4%) of the pregnant women had their infants through the normal vaginal delivery, however, caesarean section, fetal distress, retained placenta and cervical dystocia were significantly higher among the adolescent pregnant women than in the adult ones ($p < 0.05$). The mean birth weight and length of infants born to the adolescent pregnant women (2.8 ± 0.5 kg and 46.6 ± 4.0 cm) were also significantly less than those born to the adult pregnant women (3.1 ± 0.5 kg and 47.9 ± 3.5 cm) respectively ($p < 0.05$).

The incidence of low birth weight (infant birth weight below 2.5 kg) was significantly higher 96 (12.2%) among the adolescent compared with the 102 (7.9%) among the adult pregnant women ($p < 0.05$). The incidence of still birth and infants born prematurely was also significantly higher among the adolescent pregnant women 60 (7.6%) and 22 (2.8%) than in the adult pregnant women 22 (1.7%) and 4 (0.3%) respectively ($p < 0.05$). The age, weight gain in pregnancy, anaemia and parity of the pregnant women significantly influenced the birth weight of their newborn ($p < 0.05$).

Discussion

The age at which pregnancy occurs is an important predictor of the pregnancy outcome for the unborn baby and the mother [6]. Pregnancy in very young women (teenage pregnancy) is generally a high risk event which is becoming a serious health and social problem all over the world, more so, in the developing countries [1]. This is because teenage girls are physically and psychologically immature for reproduction. Adolescence is a time of intense growth second to infancy. Thus, because growth is not yet completed at this period, pregnancy causes competition for nutrients between mother and foetus

in adolescent pregnant mothers which often have adverse consequences on both the mother and the child [3]. In addition, there are some extrinsic factors such as late or inadequate prenatal care, lack of information and experience, poor socio-economic conditions, which affect the outcome of pregnancy in the teenage girls [7].

In this study the mean age of the adolescent pregnant women was 18.0 ± 1.1 years and a higher proportion of adolescent pregnant women were between the ages of 18 and 19 years. These findings were consistent with the report of Ihejiamaizu *et al.* [6], which states that, more adolescents gave birth at ages 18 and 19 compared to those below 18 years of age in Africa. Among the adult mothers, majority of the pregnant women were between the ages of 25 and 34 years with a mean age of 28.0 ± 5.1 years. This age falls within the normal age range recommended for childbearing [8].

Unlike the adult pregnant women who were mostly petty traders, artisans and civil servants, the adolescent pregnant women that were involved in this study were mostly students, full house wives or petty traders. This reveals the poor socio-economic conditions of the adolescent pregnant women in this region which could negatively affect their self and clinical care as well as the outcome of their pregnancy. It is not surprising that a higher percentage of the adult pregnant women had higher rates of antenatal care utilization compared with the adolescent pregnant women. All teenage mothers need to be advised on the importance of antenatal care, as poor utilization of quality reproductive health services are known to contribute significantly to high maternal mortality [9].

Nutritional status of women has been considered an important prognostic indicator of pregnancy outcomes. Thus, nutritional support should be guided by the need to achieve sufficient maternal weight gain, to produce an infant in the optimal weight range, of maximum probability of child survival [10]. Increased weight gain and lower weight gain than the recommended weight gain, was reported to be associated with adverse pregnancy outcome [11-12]. In this study, a significant positive relationship was observed between infant birth weight and maternal weight gain in pregnancy ($r_s = 0.18$, $p < 0.05$). This findings further confirms the report of McGuire and Popkin [13], the weight gain during pregnancy whether over a limited number of weeks or the total weight gain, during gestation strongly correlate with foetal growth and it is a critical indicator of birth weight. Different studies have recommended weight

gains during pregnancy. For example, Scholl *et al* [14], recommended a weight gain of 1.7kg at the end of the first trimester (13th week). The Institute of Medicine (IOM) recommendation [10] encourages a total weight gain of 12.5-18kg for young adolescents, because these amounts of weight gain are compatible with their producing normal-birth-weight babies. IOM recommendation also encourages adolescent mothers to gain more weight than adult mothers to deliver the same sized infants [10]. The record of the prenatal weight of the women in this study was not available because majority of the pregnant women did not know their prenatal weight and also did not attend antenatal clinic during the first trimester of their pregnancy. Thus, the calculation of their total pregnancy weight gain could not be made. However, according to Brown *et al* [14] the rate of weight gain in pregnancy is generally higher between the second and the third trimester [15]. Based on the IOM recommendation, the total weight gain from the beginning of the second trimester to the end of the third trimester should range between 10.8 – 17.3kg [10].

However, it was observed in this study that the mean pregnancy weight gain of a high percentage of the pregnant women between the second and the third trimester was less than 6.0kg. About 75% of all the women did not reach the recommended weight gain. A higher proportion of the adolescent compared to the adult pregnant women had pregnancy weight gain below 6.0kg between the second and the third trimester ($p < 0.05$). Also the mean weight gain of the adolescent pregnant women was significantly lower than the adult ones ($p < 0.05$). The lower weight gain of the adolescent mothers could be attributed to competition for nutrients and energy between the adolescent mothers and their foetus. Women with lower than normal maternal weight gain have been shown to be at increased risk for adverse pregnancy outcomes such as low birth weight and intrauterine growth retardation (IUGR) [16]. This also indicates that the risk of delivering babies with LBW is much greater among the adolescent than in the adult pregnant women in this study.

Parity, was found to significantly influence infant birth weight in this study ($p < 0.05$). It was observed that a direct and positive relationship exists between the parity of the pregnant women and the birth weight of their infants. This indicates that pregnant women who were multiparous had a lower chance of having low birth weight babies compared to pregnant women who were nulliparous. Although majority of the adolescent pregnant women were nulliparous, the weight gain in the adolescent pregnant

women who were multiparous was higher compared to the adolescent pregnant women who were nulliparous. Also in comparison to the nulliparous adolescent pregnant women, the nulliparous adult pregnant women had a higher but not significant mean weight gain in pregnancy ($p > 0.05$). It was observed among the pregnant women that the higher the parity the greater the gestational weights gain. According to Harris *et al* [17], greater parity-associated weight gain appears to be as a result of cumulative increase in gestational weight gained with successful pregnancies.

An observation made from this confirms WHO(18) and Adedoyin and Adetoro[19] that adolescent girls are at higher risks of complications during pregnancy than the adult women as the complications in pregnancy were significantly more in the adolescent pregnant women than in the adult pregnant ones. For example, the incidence of eclampsia, anaemia, and elevated blood pressure at the third trimester, cervical dystocia, and retained placenta were higher among the adolescent than the adult pregnant women ($p < 0.05$). Although normal vaginal delivery was the most common type of delivery among all the women, adolescent women experienced a higher rate of cesarean section (CS) than the adult pregnant women ($p < 0.05$). The use of caesarean section on adolescents is often considered a proxy measure of underlying complications. However, this may not be true of many developed countries where CS now constitutes a high percentage of all deliveries (WHO, 2004a). These delivery complications in adolescent women could be caused by several inter-linked factors such as their pelvic muscles and bones not yet reaching full maturity, lower utilization of health services to have antenatal care, and poor nutrition of the adolescent mothers. Efforts should be directed to discourage adolescent pregnancy in every society since it has been discovered to be associated with a lot of adverse pregnancy outcomes.

All these associated factors of gestational weight gain and LBW, are mainly a reflection of poor maternal nutrition, which indicates that having low weight babies can be prevented by better nutrition. Adequate nutrition, better education, availability of good health services and clean environment are crucial for greater weight gain during pregnancy[21]. In effect, conditions characterized by inadequate care for women, are reflected by high incidence of LBW. It must be recognized that adequate infant weight at birth is internationally accepted as a major determinant of an infant potential for survival, future

development and wellbeing. Low birth weight children are disadvantaged even before they are born and evidence suggests that these children rarely catch up with growth [21]. The recent evidence has shown that babies born with low birth weight are more prone to chronic non-communicable diseases in adult life [21]. A group of studies have also suggested an inverse relationship between low infant weight at birth and the risk of long – term adverse health outcome, such as hypertension, obesity, glucose intolerance, and cardiovascular disease [22].

It is thus recognized that maternal health and nutrition education are important for the survival and well-being of women in their own right, and are key determinants of the health and well-being of their children most especially in early infancy. In adolescent pregnancy, a major factor contributing to poor maternal nutrition has been implicated as an important factor in the high incidence of LBW, and reproductive capacity in this study. The incidence of LBW in the adult pregnant women also indicates the precarious conditions of nutrition security in many Nigerian households. The widespread poverty, lack of social support and economic hardships that characterized the 1990's, and lingering to the present times, might also offer explanations for the observed incidence of LBW in this study.

In conclusion, this investigation has shown that weight gain in pregnancy is an important determinant factor affecting birth weight as the adolescent mothers had lower weight gain during pregnancy and lower infant birth weights than the adult pregnant women. Complications in pregnancy were also more in adolescent compared with the adult pregnant women. Adolescent pregnant women were particularly affected by anaemia, high blood pressure and difficulty in delivering their babies. Thus effective health programs need to be developed to promote sound nutritional status in pregnant women for them to gain weight within the recommended weight gain range. All the teenage mothers also need to know that due to their age, they are prone to the risk of pregnancy complications and thus need to make efficient use of antenatal care services available to them. In Nigeria the teenage mothers should be given some social support such as free access to medical care. Careful monitoring of the fetal and mother's growth should be regularly performed.

The information from this study reveals the risk of adolescent pregnancy in Nigeria and the need to specially address the nutritional and the other challenges of adolescent reproductive health

behaviour and develop effective strategies to discourage adolescent pregnancy, in Nigeria.

References

1. Chen XK, Wen SW, Fleming N, Demissie K, Rhoads G and Walker M. Teenage pregnancy and adverse birth outcomes: a large population based retrospective cohort study. *International Journal of Epidemiology* 2007; 36:368-373.
2. Barton J and Parry- Jones W. Adolescence In: Detels R, McEwen J, Beaglehole R, Tanaka H. (4TH Eds), *Oxford Textbook of Public Health*. Oxford University Press 2002; Pp 1134
3. Desile H, Chandra-Mouli MD and de Benoist B. Should adolescent be specifically targeted for nutrition in developing countries: To address which problems and how? *Bulletin of the World Health Organization*, Geneva 2001; 22: 443-453
4. Lawoyin T.O. and Oyediran A.B. Prospective Study on some factors which Influence the delivery of Low Birth Weight Babies in a Developing Country. *African Journal of Medical Science* 1992; 21: 33-39.
5. Oguntona C.R.B. and Akinyele I.O. Weight gain and Pregnancy outcome in Nigeria Adolescents. *West African Journal of Food and Nutrition*. 2004; 7:1-11.
6. Ihejia maizu EC, Okoro J and Obafemi FN. Cost and Value of Children in Akwa Ibom and Cross River States. Commissioned Study, World Bank Population Research Fund, Ibadan, Nigeria Institute of Social and Economic Research. 1998.
7. Chahande MS, Jadhao AR, Wadhva SK and Ughade S. Study of some Epidemiological Factors in Teenage Pregnancy- Hospital Based Case Comparison study. *Indian Journal of Community Medicine*. 2002; 27:127-130.
8. Passmore R and Estwood M.A. *Human Nutrition and Dietetics*. 8th Edition. , Published by English Language Book Society/Churchill Livingstone. 1986; pg575-587
9. National Demographic Health Survey. Findings and Implication for Action. South West Zone. Federal Office of Statistical/IRD/ Macro International Inc. 2003
10. Institute of Medicine, Food and Nutrition Board, Committee on Nutritional Status During Pregnancy and Lactation, Subcommittee on Dietary Intake and Nutrient Supplements During Pregnancy, Subcommittee on Nutritional Status and Weight Gain During Pregnancy.. *Nutrition during Pregnancy Part 1-Weight gain, Part-*

- Nutrient Supplements. Washington DC: National Academy Press. 1990.
11. Abrahams B, Carmicheal S and Selvin S. Factors associated with the pattern of maternal weight gain during pregnancy. *Obstetrics and Gynaecology*. 1995;86: 170-176
 12. Johnston CS and Kandell LA. Pregnancy weight and rate of maternal weight gain in adolescents and young adults. *Journal of American Dietetics Association* 1992; 92:1515-1517.
 13. Mcguire JS and Popkin BM. Helping women improve nutrition in the developing World Part 1, World Bank Technical paper No 114, World Bank, Washington DC. 1990.
 14. Scholl TO, Hediger ML, Ances IG, Belsky DH and Salmon RW. Weight gain during pregnancy in adolescence: predictive ability of early weight gain. *Obstet Gynecol* 1990; 75:948-953.
 15. Brown J. E., Murtaugh M. A., Jacob D. R. and Margellow H. C. Variation in newborn size by trimester weight change in pregnancy. *Am. J Chin Nutr*. 2002; 76:205-209
 16. Ehrenberg H, Dierker L, Milluzzi C and Mercer B. Low maternal weight, failure to thrive in pregnancy, and adverse pregnancy outcomes. *Am J. Obstet Gynecol*. 2003;189:17265-17305.
 17. Haris H. E., Ellison G.T.H and Holliday M. Is there an independent association between parity and maternal weight gain? *Annals of Human Biology*. 1997; 24: 507-519.
 18. World Health Organization. Discussion Paper on Adolescent; Adolescent Pregnancy, issues in adolescent health and development. World Health Organization. Geneva 2004a.
 19. Adedoyin M. A. and Adetoro O. Pregnancy and its outcome among teenage mother in Ilorin, Nigeria. *East African Medical Journal* 1989; 66:448-452.
 20. World Health Organization Nutrition in Adolescent issues and challenges for the health sector; issues adolescent health and development. World Health Organization. Geneva. 2005.
 21. World Bank Repositioning Nutrition as Central to Development. A strategy for Large Scale Action. The World Bank, Washington, DC USA. 2006; 48.
 22. Barker D.J.P. F *et al* Origins of coronary heart disease. *British Medical Journal* 1995; 311: 171-174.

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