



## Research article

## Obstetric outcomes: A comparison of teenagers and adults in the Cape Coast metropolis, Ghana

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## ABSTRACT

Prevalence of teenage pregnancy is very high in the Central Region of Ghana. Although, pregnant teenagers are perceived to be high-risk mothers, very little has been documented about obstetric outcomes among these mothers in Ghana. This case-control observational study compared maternal and perinatal outcomes between teen and adult mothers in the Cape Coast metropolis. Data on maternal and perinatal outcome variables were collected with a data extraction form from maternal history record and delivery record books of 505 teens and 501 adults. Maternal and perinatal outcomes for the two groups were compared using chi-square or Fisher's exact test and odds ratios at 95% confidence interval. Prenatal services utilization was high among the participants. Prevalence of adverse maternal and perinatal outcomes were low, which is comparable between the two groups. Spontaneous vaginal delivery was higher in the teens with the adults having higher predisposition for caesarean section. The adult mothers were more likely to have preterm delivery and babies with low minute 1 APGAR score, the teens on the other hand had babies with significantly lower birth weight. The favourable and comparable pregnancy outcomes among the participants could be attributed to the high prenatal service utilization. Improved access to prenatal service utilization would produce better pregnancy outcomes.

## 1. Introduction

In general, teenage pregnancy is believed to carry a higher risk of adverse maternal outcomes [1]. Several research findings the world over have reported adverse outcomes of teenage pregnancy but these findings have generally not been consistent. Several studies reported that anaemia [2, 3, 4, 5], hypertensive disorders [5, 6, 7, 8], gestational diabetes [9], premature rupture of membrane [5], ruptured uterus, antepartum/post partum haemorrhage [7, 8] and chorioamnionitis were more prevalent in pregnant teenagers than their adult counterparts. Other studies indicated no significant difference in anaemia [8, 10] hypertensive disorders [6, 7, 8], gestational diabetes [5], PROM and haemorrhage [7, 8] between teenagers and adults.

Reports from findings of studies on the mode of delivery in pregnant teenagers in comparison with their adult counterparts have been very conflicting. Whereas Sulaiman et al [7] and Ezegwui et al [11] reported an increased risk of caesarean section among teenagers, others reported a rather increased occurrence of spontaneous vaginal delivery [12, 13, 14]. The better predisposition of pregnant teenagers to have a spontaneous

vaginal delivery is attributed to better myometrial function and greater tissue elasticity [15].

Adverse perinatal outcomes reported to be higher among pregnant teenagers than adults were stillbirth [16, 17], preterm delivery [4, 5, 12], low birth weight [4, 5, 12], low APGAR score at minute 1 and 5, congenital malformation, perinatal death [18, 19, 20], and birth injuries [21].

On the contrary, other researches reported no significant difference or a higher prevalence of stillbirth [22] low birth weight [23, 24] preterm delivery [11, 25, 26] low APGAR score [6] and asphyxia [8, 27] in adults than in teenagers. Although, birth trauma might occur during uncomplicated deliveries due to pressure during passage through the birth canal, it was suggested that factors such as inadequate skilled birth attendant could contribute to birth trauma [28]. The Central Region, persistently recorded the highest rate of teenage pregnancy in Ghana yet little has been documented about maternal and perinatal outcomes among this group in the study settings. This case-control observational study determined the prevalence of adverse obstetric outcomes, and compared maternal and perinatal outcomes of pregnant teenagers and

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their adult counterparts in the Cape Coast Metropolis, the Central Regional capital of Ghana.

## 2. Methodology

### 2.1. Study design

This Case-control observational study was conducted in three hospitals in the Cape Coast metropolis between January and August 2016.

### 2.2. Ethical consideration

The study was approved by the Institutional Review Board of the University of Cape

Coast and the participants gave informed written consent before they were enrolled.

We adhered strictly and completely to all protocols and standards with respect to the conduct of research involving human subjects according to the Helsinki Declaration.

### 2.3. Study population

The target population for the study comprised all mothers who delivered in any of the three hospitals in Cape Coast from January 1 to December 31, 2015.

Data available from the Ghana Health Service's *District Health Information Software 2 (DHIS 2)* showed that there were 4,589 mothers. There were 582 cases (mothers aged 13–19 years) and 4,007 controls (mothers aged at least 20 years) within the period.

### 2.4. Study participants

The study participants were drawn from the Cape Coast Metropolitan, University of Cape Coast and the Cape Coast Teaching hospitals. Five hundred and five (505) pregnant teenagers and 501 adults 20–34 years, who delivered between January and December 2015 were selected to match.

### 2.5. Sample size determination and sampling procedure

The sample size for the study was computed in the G-Power Software (version 3.1). Basic concepts were examined before utilising the statistical software package to illustrate the use of alpha level, beta level and effect size in sample size calculation involving, for example, case-control studies, t-tests, Analysis of Variance (ANOVA) and Chi-square tests, among others. With the following assumptions:

- 1. Assumptions :**
  - Odds ratio = 2
  - Exposed controls = 5%
  - Alpha risk = 5%
  - Power = 80%
  - Probability of an exposure – discordant pair = 13.5714%
  - Matched subjects
- 2. Estimated sample size (number of pairs) :**
  - Number of exposures discordant – pairs = 69
  - Number of pairs = 503
  - Total sample size = 1006**

Half of the subjects (503) were cases, while the remaining half (503) were controls. The number of participants studied from each facility was arrived at based on the following formula,  $f = \frac{n}{N}$ . The considered sample size is  $n$ , the population size is  $N$  and  $f$  is the sample fraction of the sample size.

For example, with regard to the case group, the formula below was applied,

$$n = \frac{503}{582}$$

$$n = 0.8643$$

The sample fraction of 0.8643 was multiplied with the size of each stratum to obtain the following sample for the Cape Coast Teaching, Cape Coast Metro and UCC hospitals as 263, 218 and 22, respectively. Similarly, the control sample sizes from the various facilities were determined by multiplying the respective totals by the sampling fraction of 0.1255. This gave sample of 239, 146 and 118 for the Cape Coast Teaching, Cape Coast Metro and UCC hospitals, respectively. The summarised information on the sample of the strata are contained in [Table 1](#) below.

In selecting the participants for the groups, purposive sampling technique was used to select the health facilities for the study. The lottery method of the simple random sampling technique was used to select the individual participants. This was to ensure that each person was given an equal chance of selection to participate. In achieving this, the maternity registers of the various facilities were obtained and the names sorted into the two respective groups based on their ages. Numbers were assigned to the names and written on pieces of papers and put in a container. The folded strips of papers were shuffled, and one strip was randomly selected at a time. After every selection, the rest of the strips in the container were re-shuffled. This continued till the total number of cases was obtained, the same procedure was carried out to select the sample for the control group.

### 2.6. Research instrument and data collection

A data extraction form was used to collect socio-demographic, maternal characteristics and maternal and perinatal outcomes from the maternal health record, the delivery register and post-natal record books. The demographic variables were age, educational background, religion, marital status, occupation, ethnicity and parity. The ANC status considered gestational age at booking and ANC attendance. The obstetric characteristics were gestational hypertension (GH), eclampsia, gestational diabetes, haemorrhage, PROM, anaemia, and modes of delivery; spontaneous vaginal, augmentation, vacuum, and caesarean section. Perinatal outcomes considered were birth outcome (still or live birth), gestational age at delivery, birth weight, and Apgar scores, asphyxia, birth trauma, and external major structural congenital defects.

### 2.7. Data analysis

The data were analyzed using descriptive and inferential statistics; frequency, mean, chi-square test or fishers exact test and odds ratios at 95% confidence interval.

## 3. Results

Majority of the pregnant teenagers (96%) were older teens aged 15 years and above with a mean age of 16.9 years. Most of them were nulliparous and were educated up to the basic level. Eight hundred and eighty-five out of 1006 (88%) of the participants met the WHO recommendation of a minimum of 4 ANC visits in the course of their pregnancy. The mean gestational age at ANC booking was 18.30+/-7.64 weeks and comparable between the two groups (see [Table 2](#)).

[Table 3](#) shows low prevalence of adverse maternal outcome among the participants, which is comparable between the two groups. With respect to mode of delivery pregnant teenagers were 1.73 times (95% CI 1.23 2.3) more likely to have spontaneous vaginal delivery than their adult counterparts. Concerning caesarean section, the adults were 69% (95% CI 0.56 0.9) more likely to have caesarean section than their teenage counterparts.

[Table 4](#) shows low prevalence of adverse perinatal outcomes among the participants. Among adverse perinatal outcomes that show

**Table 1.** Facility-based sample for case and control groups.

Facility	Age Group		Total
	13-19 (Case)	20-34 (Control)	
Cape Coast Teaching Hospital	263	239	502
Cape Coast Metro Hospital	218	146	364
UCC Hospital	22	118	140
Total	503	503	1006

significant difference were preterm birth, low birth weight and low minute 1 APGAR Score. Pregnant teenagers were 1.67 times (95% CI 1.54 3.4) more likely to have babies with low birth weight than the adults. Whereas the adults were 1.58 times (95% CI 1.38 2.6) more likely to have preterm birth compared to the pregnant teenagers. With respect to APGAR score at minute 1 the adults were 2.25 times (95% CI 1.95 3.1) more likely to have babies with APGAR score less than 7 than the teens. The prevalence of asphyxia was low and there is no statistically significant difference between pregnant teenagers and the adults.

#### 4. Discussion

This study compared maternal and perinatal outcomes between pregnant teenagers and adults. Majority of the participants were older teens with at least nine years of basic education with most of them being unemployed. Christians and Muslims constitute the majority and were not married.

An earlier study reported that the adverse maternal and perinatal outcomes observed among pregnant teenagers were due to inadequate ANC services utilization rather than the age of the pregnant teenager [12]. The risk factors for non-ANC attendance were mostly socio-demographic, since older pregnant teenagers are anatomically and physiologically matured for motherhood [1]. Factors which negatively influenced ANC attendance were low level of education, stigmatization due to religious beliefs that frown on premarital sex, non-affordability due to unemployment to name a few, were barriers [1, 7, 8, 12], that were reduced by the implementation of a social support for safe motherhood in the Cape Coast Metropolis which might be the reason for the high ANC attendance [30]. It is therefore not surprising that most of the maternal and perinatal outcomes are comparable between the two groups.

The findings of this study revealed that antenatal clinic attendance has positive influence on spontaneous vaginal delivery, stillbirth, pre-term delivery and Apgar score at minute 1. The study also observed that teenagers who attended ANC were likely not to have caesarean section. The findings of this study revealed no birth trauma and congenital anomalies among neonates of pregnant teenagers, which could be attributed to utilized ANC services and skilled delivery by midwives and obstetrician, which were observed to have improved tremendously in the metropolis.

Among the modes of delivery, it was realized that spontaneous vaginal delivery was higher among the pregnant teenagers. This finding is consistent with what has been reported earlier [8]. Contrary to the finding of the current study several studies [12, 13, 14] reported that teenage pregnancy was associated with increased risk of cesarean section

**Table 2.** Socio-demographic characteristics of respondents.

Socio-demographic variables	Teenagers (n = 505)		Adults (n = 501)		Total (N = 1,006)	
	Freq.	%	Freq.	%	Freq.	%
<b>Educational Status</b>						
No formal education	81	16.0	81	16.1	162	16.1
Basic	333	65.9	226	45.1	559	55.6
Secondary	88	17.5	90	18.0	178	17.7
Tertiary	3	0.6	104	20.8	107	10.6
<b>Religion</b>						
Christianity	453	89.7	437	87.2	890	89.5
Islam	42	8.3	55	11.0	97	9.6
Others	10	2.0	9	1.8	19	1.9
<b>Marital status</b>						
Married	85	16.8	430	85.8	515	51.2
Single	395	78.2	61	12.2	456	45.3
Divorced	0	0.0	1	0.2	1	0.1
Non-response	25	5.0	9	1.8	34	3.4
<b>Parity</b>						
0	420	83.2	102	20.4	522	51.9
1-2	75	14.8	205	40.9	280	27.8
3 and above	10	2.0	194	38.8	204	20.3
<b>Occupational status</b>						
Employed	170	33.7	429	85.0	599	59.5
Unemployed	335	66.3	72	15.0	407	40.5
<b>Ethnicity</b>						
Akan	417	82.6	400	79.8	817	81.2
Guan	0	0.0	1	0.2	1	0.1
Ewe	11	2.2	17	3.4	28	2.8
Ga/Dangme	7	1.3	6	1.2	13	1.3
Others	70	13.9	77	15.4	147	14.6
<b>Name of Hospital Facility</b>						
Cape Coast Teaching Hosp.	262	51.9	245	48.9	507	50.4
Cape Coast Metro Hosp.	220	43.6	146	29.1	366	36.4
UCC Hospital	23	4.5	110	22.0	133	13.2

**Table 3.** Obstetric Outcomes of Pregnancy, comparison between Teenagers and Adults.

Obstetric outcomes	Teenagers	Adults (Ref)	Chi-square value	Df	p-value	OR/CI
<b>Complications of pregnancy</b>						
<i>GH (BP &gt; 140/90)</i>						
Present	18	31	3.735	1	0.053	0.56
Absent	487	470				
<i>Eclampsia</i>						
Present	11	14	0.394	1	0.530	0.78
Absent	494	487				
<i>Gestational Diabetes</i>						
Present	1	5	2.715	1	0.099	0.2
Absent	505	496				
<i>Antepartum Haemorrhage</i>						
Present	7	12	1.382	1	0.239	0.57
Absent	498	489				
<i>Post-partum Haemorrhage</i>						
Present	24	16	1.601	1	0.206	1.51
Absent	481	485				
<i>PROM</i>						
Present	25	33	1.239	1	0.266	0.74
Absent	480	468				
<i>Anemia (Hb &lt; 11) at Registration</i>						
Present	8	16	2.797	1	0.094	0.49
Absent	497	485				
<i>Anemia (Hb &lt; 11) at 36 weeks</i>						
Present	13	23	2.964	1	0.085	0.55
Absent	492	478				
<b>Mode of delivery</b>						
<i>Spontaneous vaginal delivery</i>						
Present	405	351	13.841	1	0.000	1.73
Absent	99	150				
<i>Augmentation</i>						
Present	59	71	1.384	1	0.239	0.8
Absent	446	430				
<i>Vacuum</i>						
Present	19	10	2.803	1	0.094	1.92
Absent	486	491				
<i>Caesarean Section</i>						
present	87	116	5.483	1	0.019	0.69
Absent	418	385				

than their adult counterpart. Meanwhile, findings of studies by others reported that the rate of cesarean delivery was similar in teenagers compared to adults [11, 20].

There could be several reasons that may be underpinning the finding of the present study. This may include good family support, early booking and adequate antenatal care provided for by the social support for safe motherhood within the Cape Coast metropolis [30]. The findings of the present study corroborate that of Sagili [26] who did not support the assumption that “teenage pregnancy” is associated with severe adverse obstetric outcome.

It was however, revealed that there were no significant differences between the pregnant teenagers and adults with respect to pregnancy complications, including anaemia, PIH, Eclampsia, gestational diabetes and PROM.

Sulaiman et al [8] found similar results in their study which showed that there was no difference in the risk of anaemia when the teenagers were compared to the adults. The reason could be that the teenagers in the studies received adequate prenatal care. The study revealed low prevalence of anaemia among the participants. Contrary to findings of other studies [3, 4, 18], who reported significantly higher prevalence of anaemia among pregnant teenagers than the adult counterparts. The Ghanaian antenatal care service provides folic acid, multivitamin and hematinic as dietary supplements for all pregnant women, which could account for the low prevalence of anaemia among the participants.

Concerning PIH, studies conducted earlier did not find significant association between teenage pregnancy and pregnancy-induced hypertension [6, 7, 8]. Shah, et al [6] discovered that PIH, was not significantly different in teenage and non-teenage mothers.

The current study results observed no significant difference between pregnant teenagers and their adult counterparts with respect to eclampsia, which is consistent with what has been reported earlier [5, 6] which indicated that adult mothers are more likely to experience eclampsia than the pregnant teenagers, which is inconsistent with the finding of other studies [7, 8]. The higher rates of antenatal clinic attendance could be the reason for the findings of the present study, where most of the hypertensive disorders might have been detected and promptly managed.

Shah, et al [6] found that gestational diabetes was not significantly different in teenage and non-teenage mothers. This finding is consistent with the current study. Contrary to findings of the current study, El-Gilany and Hammad [29], concluded that gestational diabetes mellitus, was more frequent among older mothers compared to the pregnant teenagers. This is incongruous with an earlier report [28], which indicated that there is a decrease in the function of B cells of pancreas and cell sensitivity to insulin with age. It was also posited that the increase of gestational diabetes with an increase in age of women could be due to

**Table 4.** Perinatal Outcomes of Pregnancy, comparison between Teenagers and Adults.

Perinatal outcomes	Teenagers	Adults (Ref.)	Chi-square value	Df	p-value	OR
<b>Severe Asphyxia</b>						
Present	59	54	0.206	1	0.650	1.1
Absent	446	447				
<b>Birth Trauma</b>						
Present	0	1	1.009	1	0.315	0
Absent	505	500				
<b>Congenital Anomalies</b>						
Present	0	1	1.009	1	0.315	0
Absent	505	500				
<b>Birth outcome (Live birth)</b>						
Present	487	477	0.945	1	0.331	1.36
Absent	18	24				
<b>Birth outcome (Stillbirth)</b>						
Present	18	24	0.945	1	0.331	0.73
Absent	487	477				
<b>Gestational age (&lt; 37 weeks)</b>						
Present	433	397	7.364	1	0.007	1.58
Absent	72	104				
<b>Gestational age (&gt; 40 weeks)</b>						
Present	21	62	22.431	1	0.000	0.31
Absent	484	439				
<b>Birth weight (&lt; 2500g)</b>						
Present	112	73	9.698	1	0.002	1.67
Absent	393	428				
<b>Apgar in first 1 min (&lt;7)</b>						
Present	416	338	29.784	1	0.000	2.25
Absent	89	163				
<b>Apgar in first 5 min (&lt;7)</b>						
Present	65	64	0.008	1	0.930	0.99
Absent	440	437				

function and structure of hemoglobin and the means of glaciations change with increased age.

Consistent with the finding of this study, Ezegwui et al [11] observed that, premature rupture of membranes was not significantly different in teenage and non-teenage mothers. Contrary to the current result Derme et al [24] observed that premature rupture of membranes (PROM) and oligohydramnios were the most common pregnancy complications among pregnant teenagers. It was only in the case of post-partum haemorrhage that teenagers had higher risk compared to adult but not significant.

Immature pelvic structures of the pregnant teenagers could cause cephalo-pelvic disproportion, which would lead to injury to the pelvic structures, thereby causing bleeding after delivery.

The results of the present study also showed that there were significant differences with respect to the modes of delivery between pregnant teenagers and adult. The differences were seen in cases of spontaneous vaginal delivery (SVD) and Caesarean section.

With respect to SVD, it was observed that the teenagers were 1.73 times more likely to have SVD than the adults. This could be attributed to the fact that the teenagers were mostly in the upper age range so majority had matured pelvis. The result of this study is consistent with the findings of other studies, who reported that pregnant teenagers had a significantly higher incidence of spontaneous vaginal delivery than their adult counterparts [8, 16, 24]. The better predisposition of pregnant teenagers to have spontaneous vaginal delivery might be due to better myometrial function and greater tissue elasticity [15]. The study also observed higher prevalence of low birth weight among neonates of teenagers than adults, which probably enhanced SVD.

Pregnant adults had higher risk of undergoing Caesarean section compared to their teenage counterparts. Similar findings were reported by

previous studies [11, 13] who also reported that the rate of emergency caesarean section is lower among pregnant teenagers compared to the adults. Most of them explained that their findings could be attributed to improved antenatal care to the teenagers. In their study, Hoque and Hoque [12] also reported that caesarean delivery was significantly lower among teenagers. Meanwhile, some literature reported that pregnant teenagers have increased risk for cephalo-pelvic disproportion leading to high caesarean section rate as compared to their adult counterpart [5, 8]. The findings of the present study revealed that the pregnant teenagers were older teens who were not likely to be at risk for cephalo-pelvic disproportion. Elective caesarean section comes with a cost which pregnant teenagers who are unemployed may not be able to afford. Also caesarean section increases the length of hospital stay of which some aspects are not covered under the Ghana Health Insurance Scheme. The Cape Coast Teaching Hospital is a referral center that receives referred cases from lower facilities that are indicative of caesarean section. These are possible reason for higher rates of caesarean section in adults than the pregnant teenagers.

Studies have reported that adverse pregnancy outcomes like preterm delivery have been associated with teenage pregnancy [4, 5, 12]. The current study observed otherwise. The adults were 1.58 times more likely to deliver preterm than their pregnant teenage counterparts, which is consistent with the findings of earlier studies [11, 25, 26]. The adults stood a higher risk of having post-term deliveries compared to the pregnant teenagers. This could be attributed to the diminished ability of the uterine muscles of the adults to initiate contractions.

The present study observed no association teenage pregnancy and stillbirth. This is consistent with the finding Hogue et al [22] who reported that, pregnant teenagers were not at a higher risk of having stillbirth delivery. On the contrary, other studies reported a higher risk in

pregnant teenagers than the adults. Iklaki et al [17] reported that macerated stillbirth among pregnant teenagers who do not utilize ANC services was significantly high. Majority of the participants of the present study utilized ANC services, which could be the reason for the low rate of stillbirth as observed by others [17].

We observed significantly lower birth weight babies of teenagers than those of the adults consistent with earlier studies that also indicated various parameters of neonatal outcome like intrauterine growth retardation (IUGR) and preterm birth among pregnant teenagers were poorer than in adults [5, 8]. Maternal nutrition plays an important role in foetal development. Most of the pregnant teenagers were unemployed hence may not be in a position to provide quality diet for optimal foetal development which could be a probable reason for the low birth weight of their neonates.

The findings revealed that pregnant teenagers had a higher risk of delivering babies with low birth weight compared to their adult counterparts. It could be a possible explanation for the high rates of spontaneous vaginal delivery among pregnant teenagers meanwhile, while adults were 2.25 times more likely to have their babies with APGAR score less than 7 at min 1 than the pregnant teenagers. The study revealed higher preterm delivery among the adults who babies were likely to have immature lungs, which could be a probable cause for the reported low APGAR score. Another possible explanation could be as a result infective uterine elasticity that could affect the progression of labour in older adults. The findings also indicated a higher birth weight neonates among the adults which is a probable cause of foetal distress due to prolong labour.

## 5. Conclusion

The pregnant teenagers in the Cape Coast metropolis were older teens who are not likely to experience adverse birth outcomes from organ immaturity. ANC service utilization was very high probably due minimized barriers to access by the implementation of free access, focus antenatal care and social support for safe motherhood. Birth traumas were also absent since all the deliveries were by either midwives and/or obstetricians. These cumulated in the comparable maternal and perinatal outcome between the pregnant teenagers and the adults. Proper implementation of the safe motherhood programmes will improve maternal and perinatal outcomes in resource-poor settings and bridge the gap between developed and developing countries.

## Declarations

### Author contribution statement

M. Siakwa: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

M. Nyarko-Sampson and S. Bruce: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

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### Declaration of interests statement

The authors declare no conflict of interest.

### Additional information

No additional information is available for this paper.

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