

## Research

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# Quality of Antenatal Care and Outcome of Pregnancy in a Semi-Urban Area in Fako Division, Cameroon: A Cross-Sectional Study

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### ABSTRACT

**Introduction:** The outcome of pregnancy depends, to a large extent, on the availability and effectiveness of antenatal care. Unskilled care before, during and after child birth, late start and inconsistent attendance of Antenatal care (ANC), and poor ANC package are seen frequently. However, the extent to which these practices affect pregnancy outcome are not known in Fako Division, South West Region, Cameroon.

**Objective:** The objective of this study was to determine the relationship between the outcome of pregnancy and the quality of ANC in the aforementioned setting.

**Patients and Methods:** This was a hospital based cross-sectional study that involved 300 immediate post-partum women in three hospitals in Fako Division, Cameroon. Data was collected using a structured questionnaire in a two-step manner; face-to-face interview, and from women's case notes during ANC and their delivery records. Data was analyzed using Epi Info™ version 7.1.4.0 (CDC, Atlanta, USA, 2015) statistical software.

**Results:** Mean gestational age at start of ANC was 19.2 weeks (SD 4.2 years), 99% of participants attended at least one ANC consultation, 15.5% started ANC early; 58% attended  $\geq 4$  ANC visits. Six-seven percent of them received adequate care. There was a strong negative correlation between gestational age at start of ANC and overall adequate care ( $p$ -value 0.001). Inadequate care, being a teenager, and single were associated with adverse pregnancy outcomes. Inadequate care was also associated with pre-term birth, post-term birth, labour induction, dystocia, labour augmentation, stillbirth, low APGAR score, and low birth weight. (All  $p$ -values  $< 0.05$ ).

**Conclusion:** Adverse pregnancy outcomes in this region were associated with poor quality ANC. Sensitization of women on the benefit of quality ANC, better health care services with well-trained health care personnel, and research to find out a more precise diagnosis of causes of adverse foeto-maternal outcomes will lead to reduced fetal and maternal morbidity and mortality.

**KEYWORDS:** ANC; Quality; Adverse pregnancy outcomes; Cameroon.

**ABBREVIATIONS:** ANC: Antenatal care; MDG: Millennium Development Goals; WHO: World

Health Organization; MMR: Maternal Mortality Ratio; TTV: Tetanus Toxoid Vaccine; IPT: Intermittent Preventive Therapy; TT: Tetanus Toxoid; LBW: Low Birth Weight.

## INTRODUCTION

The goal of antenatal care (ANC) is to ensure that gestational outcomes end in the birth of a healthy baby without adversely affecting the health of the mother. This is achieved by: detection and early treatment of problems and complications; prevention of complications and diseases; health promotion, preparation for childbirth and potential complications.<sup>1</sup>

The fifth Millennium Development Goals (MDG) of World Health Organization (WHO) planned to reduce maternal deaths by three-quarters between 1990 and 2015.<sup>2</sup> Good quality ANC is one of the strategies used to achieve this. As a result of the global effort, there has been a tremendous decrease in Maternal Mortality Ratio (MMR). Complications during pregnancy, childbirth and the post-natal period are the leading causes of death and disability among women of reproductive age.<sup>3</sup> In 2013, approximately 289,000 women died during and following pregnancy and childbirth globally.<sup>4</sup> A large majority of these deaths are preventable with three-quarters directly associated to obstetric complications such as hemorrhage, infections, pregnancy induced hypertension.<sup>5</sup> Almost all of these deaths (99%) occur in low-income countries.<sup>3</sup> Sub-Saharan Africa has the highest MMR in the world despite all strategies and interventions to improve maternal health.<sup>2,4</sup> To achieve the above MDG, it is estimated that an annual decline in maternal mortality of 5.5% is needed. However, between 1990 and 2013, the global maternal mortality ratio (i.e. the number of maternal deaths per 100,000 live births) declined annually by 2.6% with a disproportionate decline in sub-Saharan region.<sup>2</sup> Therefore, most sub-Saharan countries will not be able to achieve this goal. Cameroon is one of these countries without an appreciable decrease in MMR.<sup>6</sup>

Good quality ANC reduces maternal morbidity and mortality, and neonatal mortality since instituting preventive and certain curative measures like early initiation of ANC, prevention and treatment of anemia, childbirth by skilled personnel etc.<sup>7-9</sup> Early initiation of ANC and attendance of four or more ANC visits are associated with higher infant birth weights and lower infant mortality rates.<sup>10,11</sup> The quality of ANC is measured by three dimensions: timing of initiation of care, the number of visits, and inclusion of all recommended components of care.<sup>12</sup>

Early initiation of antenatal care is associated with favorable pregnancy outcomes.<sup>13-16</sup> But less than 30% of women start ANC early (<14 weeks) in South Western Nigeria<sup>9</sup> and in Khartoum, Sudan<sup>17</sup> and some countries in East Africa.<sup>18-20</sup> In Buea Health District, Cameroon, only 27.2% of women start ANC in the first trimester because of factors like; poor accessibility of ANC clinics, financial constraints and lack of informa-

tion on the benefits of ANC.<sup>21</sup>

The purpose of this study was to relate adverse maternal and fetal outcomes to the quality of antenatal care received.

## PATIENTS AND METHODS

### Study Design

This was a hospital based cross-sectional study carried out in Fako Division from 15<sup>th</sup> December, 2014 to 12<sup>th</sup> March, 2015. Ethical clearance was obtained from the Institutional Review Board of the Faculty of Health Sciences, University of Buea and administrative approval from the Regional Delegate of Public Health for the South West Region and the Chief Medical Officers of the Hospitals where the study was carried out.

### Study Setting

The study was conducted in three hospitals in Fako Division in the South West Region of Cameroon: District Hospital Limbe and the Regional Hospitals of Buea and Limbe, Cameroon.

Buea Regional Hospital has a twenty bed Obstetric and Gynecological unit and is headed by a gynecologist. Approximately, 840 deliveries are carried out annually in this unit. There are 6 mid-wives and 6 paramedical staff. The latter group of personnel is not trained in offering specialize obstetric care, but are mainly involved in cleanliness of the unit and run errands like taking samples and collecting results from the laboratories. Surgical operations are done in the major surgical theatre of the hospital.

Regional Hospital Limbe is the biggest hospital in Limbe in terms of infrastructure and patient influx. About 900 deliveries are conducted in the Obstetric and Gynecological Unit annually. The unit has a 20 bed capacity with two gynecologists, 4 midwives and 5 paramedical staff. Surgical procedures are performed in the major surgical theatre of the aforementioned hospital.

The District Hospital Limbe is located in Bota Health Area. A gynecologist heads the Obstetrics and Gynecology unit with 3 mid-wives and 5 paramedical staff as collaborators. The unit has 13 beds capacity and about 720 deliveries are conducted in the unit annually.

### Sample Size Calculation

The sample size was calculated using the formula for comparing two proportions.<sup>22</sup> For a confidence level of 95%,  $Z_{crit}=1.96$   $Z_{pwr}$ =standard normal deviate for the desired statistical power of 90%=0.90. The pre-study prevalence of adverse outcome in participants with low birth weight in women with

poor quality ANC, =11.9%=0.12<sup>13</sup> while those with low birth weight in women with good quality ANC, =2.2%=0.022.<sup>13</sup> A minimum sample size of 289 pregnant women was required. However, three hundred participants were enrolled to make our results more justifiable.

### Approach to Participants and Sampling

The study population consisted of 300 pregnant women in Fako Division, South West Region. The target population was immediate post-partum women in the District Hospital Limbe, and Buea and Limbe Regional Hospitals. Convenient sampling method was used to enroll participants who gave written consent after the objectives and what the study entailed had been explained to them. Only participants who gave birth after the 28<sup>th</sup> week of gestation and were in the immediate postpartum period were enrolled.

### Data Collection

The questionnaire of the study was adapted from a standard questionnaire for assessing quality of ANC.<sup>23</sup> Modifications were made by studying the questionnaires used in similar studies<sup>7,13,16,24-26</sup> and pre-tested amongst twenty participants in Buea Regional Hospital. Data was collected in two phases using the pre-tested questionnaire from the case notes of the participants used during ANC, birth records, and from face-to-face interviews.

**Data from case notes included:** Obstetric history; gestational age at first ANC; number of ANC visits; documentation of activities carried during each visit like blood pressure and weight measurements, administration of Tetanus Toxoid Vaccine (TTV) and Intermittent Preventive Therapy (IPT) for malaria and laboratory investigations. Information on the fetal and maternal outcomes of deliveries was obtained from deliveries notes.

**Data obtained from face-to-face interview was on two components of ANC:** Health promotion and preparation for delivery. Information on health promotion included health topics like breastfeeding, danger signs of pregnancy, prevention of malaria, etc.

### Data Management and Analysis

The questionnaires were cross-checked for completeness and coded to ensure participant's confidentiality before data storage. A scoring system was developed to score the quality of ANC received. The questionnaire was divided into sections according to the main components of ANC (preventive care, health promotion, curative care, and preparation for childbirth). Questions in each section comprised activities or procedures that are supposed to be carried out during ANC. Each activity or procedure properly carried out was allotted a point. All the points in each section were summed up to obtain a woman's score in

that section (e.g. health promotion score). All the points in all sections were summed up to obtain an overall score. Scores of  $\geq 70\%$  were considered adequate quality of care in each category. After scoring each questionnaire, the data was keyed in to Epi Info™ version 7.1.4.0 (CDC, Atlanta, USA) statistical software for analysis and also exported to Microsoft™ Excel 2007. Comparison between the two groups was done using the Chi Square or Fishers exact tests where applicable. Pearson correlation coefficient was used to evaluate the correlation between early initiation of care and likelihood of having an overall adequate care and favorable outcomes.

### RESULTS

Three hundred participants were enrolled: 120, 104 and 76 from Regional Hospital Limbe, Regional Hospital Buea and Bota District Hospitals respectively during the study period. The ANC records of two participants were partially exploited for analysis because of incomplete information. One participant enrolled in the immediate postpartum period did not receive ANC.

### Socio-Demographic and Obstetric Characteristics of Participants

The mean age of the participants was 27.0 years (SD5.7) with a range of 16-41 years. One hundred and ninety one (64%) participants were married, 104(35%) single and 3(1%) were widows. The gravidity of participants ranged from one to nine. Most of the participants (36.3%) were primigravidas.

### ANC Attendance of the Study Population

The majority of participants who came for childbirth, 297(99%) attended ANC. The mean gestational age at start of ANC was 19.2 weeks (SD4.2 weeks) with a range of 8-31 weeks. Only 46 out of 297(15.5%) started ANC early ( $\leq 14$  weeks) while 251(84.5%) started ANC after 14 weeks. Of the 297 who attended ANC, 172(58%) attended four or more visits while 125(42%) attended less than four visits. Most of the participants had adequate preventive care (i.e. had received more than two doses of IPT for malaria, slept under mosquito bed net and had received at least two doses of TT in the current pregnancy) 250(84.1%), health promotion 152(51.2%) and overall adequate care 198(66.7%). However, 230(77.4%) were inadequately prepared for childbirth.

### PREVENTIVE CARE COVERAGE OF STUDY POPULATION

Two hundred and seventy-seven women (93.3%) received at least two doses of Intermittent Preventive Treatment (IPT) for malaria. The majority 187(63%) slept under mosquito treated bed nets at night, 160(54%) received at least two doses of Tetanus Toxoid (TT), but only 92(31%) had received five doses of TT. Most women received adequate preventive care. Of the 297 women evaluated for this, 250(84.2%) had adequate preven-

tive (scored  $\geq 70\%$ ) while 47(15.8%) had poor preventive care score.

**TIMING OF ANC AND ADVERSE PREGNANCY OUTCOMES (APOs)**

As shown in Table 1, out of the 297 women who attended ANC, 46(15.5%) started early while 251(84.5%) started late. There was a statistically significant difference in four APOs between those who started ANC early and those who started late.

APO	Early ANC (N=46)	Late ANC (N=251)	Total (N=297)	P-value
Preterm	04(8.7)	46(18.3)	50(16.8)	0.139
Low BW	05(10.8)	39(15.5)	44(14.8)	0.501
Still birth	00(0.0)	15(5.9)	15(5.1)	0.137
Low APGAR	01(2.2)	43(17.1)	44(14.8)	0.006
Congenital anomaly	00(0.0)	01(0.4)	01(0.3)	0.366
Birth Injury	00(0.0)	01(0.4)	01(0.3)	0.668
Post term	00(0.0)	02(0.8)	02(0.6)	0.544
Macrosomia	02(4.3)	06(2.4)	08(2.7)	0.359
Labour Induction	01(2.2)	13(5.2)	14(4.7)	0.001
Labour augmentation	01(2.2)	24(9.5)	25(8.4)	0.001
Dystocia	00(0.0)	19(7.5)	19(6.4)	0.001
Pre-eclampsia	02(4.3)	05(1.9)	07(2.3)	0.573
Eclampsia	00(0.0)	02(0.8)	02(0.6)	0.544
Prolonged 2 <sup>nd</sup> stage	00(0.0)	01(0.4)	01(0.3)	0.668
Birth canal trauma	04(8.7)	31(12.4)	35(11.8)	0.480
Episiotomy	00(0.0)	01(0.4)	01(0.3)	0.668
PPH	00(0.0)	05(1.9)	05(1.7)	0.334

Table 1: Summary of timing ANC and APOs.

**NUMBER OF ANC VISITS AND ADVERSE PREGNANCY OUTCOMES**

One hundred and seventy-one (57.6%) out of the 297 attended four or more visits while 126(42.4%) attended less than four visits. There was a statistically significance difference in four adverse pregnancy outcomes between the two groups. Preterm delivery, low APGAR score, stillbirth, and LBW were associated with attendance of less than four ANC visits as summarized in the Table 2.

APO	$\geq 4$ ANC visits (N=171)	$< 4$ ANC visits (N=126)	Total (N=297)	P-value
Preterm	08(4.7)	42(33.3)	50(16.8)	0.001
Low BW	07(4.0)	36(28.5)	43(14.5)	0.001
Still birth	02(1.2)	13(10.3)	15(5.1)	0.001
Low APGAR (less than 7)	13(7.6)	30(23.8)	43(14.5)	0.001

Table 2: Number of ANC visits attended and adverse pregnancy outcomes.

**ADEQUACY OF LABORATORY INVESTIGATIONS AND APOs**

A greater proportion of women who attended ANC, 241(81.1%) did adequate ANC investigations while 56(18.9%) did not. There was a statistically significant difference in four of the APOs between the two groups. Inadequacy of laboratory investigations was associated with preterm delivery, stillbirth, low APGAR score, and Low Birth Weight (LBW) as summarized in Table 3.

APO	$\geq 70\%$ ANC tests (N=241)	$< 70\%$ ANC tests (N=56)	Total (N=297)	P-value
Preterm	27(11.2)	23(41.1)	50(16.8)	0.0001
Low BW	26(10.8)	18(32.1)	44(14.8)	0.0001
Still birth	07(2.9)	08(14.3)	15(5.1)	0.002
Low APGAR	27(11.2)	17(30.3)	44(14.8)	0.001

Table 3: Adequacy of laboratory investigations and adverse pregnancy outcomes.

**ADEQUACY OF PREVENTIVE CARE AND APOs**

Two hundred and ninety-nine participants were evaluated for this category. Two hundred and fifty-one (83.9%) had adequate preventive care while 48(16.1%) had inadequate preventive care. Inadequate preventive care was associated with preterm birth, stillbirth, low birth weight and dystocia as summarized in Table 4.

APO	Preventive Care Score $\geq 70\%$ (N=251)	Preventive Care Score $< 70\%$ (N=48)	Total (N=299) how man-age	P-value
Preterm	23(9.1)	28(58.3)	51(17.1)	$< 0.001$
Low BW	22(8.7)	23(47.9)	45(15.1)	0.001
Still birth	05(1.9)	11(22.9)	16(5.4)	0.001
Low APGAR	26(10.3)	19(39.5)	45(15.1)	0.001
Congenital anomaly	01(0.4)	00(0.0)	01(0.3)	0.748
Birth Injury	01(0.4)	00(0.0)	01(0.3)	1.000
Post term	02(0.8)	00(0.0)	02(0.6)	1.000
Macrosomia	08(3.2)	00(0.0)	08(2.7)	0.363
Labour Induction	02(0.8)	12(25.0)	14(4.7)	0.270
Labour augmentation	21(8.4)	04(8.3)	25(8.4)	0.113
Dystocia	19(7.6)	00(0.0)	19(6.3)	0.018
Pre-eclampsia	07(2.8)	00(0.0)	07(2.3)	0.456
Eclampsia	02(0.8)	00(0.0)	02(0.6)	1.000
Prolonged 2 <sup>nd</sup> stage	01(0.4)	00(0.0)	01(0.3)	1.000
Birth canal trauma	29(11.6)	06(12.5)	35(11.7)	0.809
Episiotomy	01(0.4)	00(0.0)	01(0.3)	1.000

Table 4: Adequacy of preventive care and adverse pregnancy outcome.



**ADEQUACY OF HEALTH PROMOTION AND ADVERSE PREGNANCY OUTCOME**

Two hundred and ninety-nine women were evaluated for this category. One hundred and fifty-three (51.2%) had adequate health promotion score while 146(48.8%) had inadequate health promotion score. There was a statistically significant difference in seven APOs between the two groups.

As shown in Table 5, inadequacy of health promotion was associated with preterm delivery; labor induction; dystocia; labor augmentation; stillbirth; low APGAR score; and low birth weight.

APO	Adequate Health Promotion (Score ≥ 70%) (N=153)	Inadequate Health Promotion (Score <70%) (N=146)	Total (N=299)	P-value
Preterm	08(5.2)	43(30.1)	51(17.1)	0.001
Low BW	09(5.9)	36(25.2)	45(15.1)	0.001
Still birth	01(0.6)	15(10.5)	16(5.4)	0.001
Low APGAR	10(6.0)	35(24.5)	45(15.1)	0.001
Labor Induction	04(2.4)	10(7.0)	14(4.7)	0.002
Labor augmentation	06(3.6)	19(13.3)	25(8.4)	0.001
Dystocia	10(6.0)	09(6.3)	19(6.3)	0.018

Table 5: Adequacy of health promotion and adverse pregnancy outcome.

**ADEQUACY OF PREPARATION FOR DELIVERY AND ADVERSE PREGNANCY OUTCOMES**

Of 299 women evaluated for this category, 67(22.4%) had adequate preparation for childbirth while 232(77.6%) had inadequate preparation for childbirth. Inadequate preparation for childbirth was associated with six adverse pregnancy outcomes as summarized in Table 6.

APO	Adequate Preparation for Childbirth (Score ≥ 70%) (N=67)	Inadequate Preparation for Childbirth (Score < 70%) (N=232)	Total (N=299)	P-value
Preterm	00(0.0)	51(20.4)	51(17.1)	0.001
Low BW	03(4.5)	42(16.8)	45(15.1)	0.006
Still birth	00(0.0)	16(6.4)	16(5.4)	0.027
Low APGAR	03(4.5)	42(16.8)	45(15.1)	0.006
Labor Induction	00(0.0)	14(5.6)	14(4.7)	0.048
Dystocia	01(1.5)	18(7.2)	19(6.3)	0.049

Table 6: Adequacy of preparation for childbirth and APOs.

**OVERALL QUALITY OF CARE AND ADVERSE PREGNANCY OUTCOMES**

The majority of participants, 200(66.67%) had adequate care and 100(33.33%) had inadequate care. Inadequate care was associated with eight adverse pregnancy outcomes as summarized in the Table 7. The difference was statistically significant in the two groups.

APO	Adequate Care Total Score ≥70% (N=200)	Inadequate Care Total Score <70% (N=100)	Total (N=300)	P-value
Preterm	08(4.0)	44(44.0)	52(17.3)	0.001
Low BW	09(4.5)	37(37.0)	46(15.3)	0.001
Still birth	01(0.5)	16(16.0)	17(5.7)	0.001
Low APGAR	14(7.0)	32(32.0)	46(15.3)	0.001
Congenital anomaly	01(0.5)	00(0.0)	01(0.3)	0.687
Birth Injury	01(0.5)	00(0.0)	01(0.3)	1.000
Post term	00(0.0)	02(2.0)	02(0.7)	0.044
Macrosomia	08(4.0)	00(0.0)	08(2.7)	0.056
Labour Induction	07(3.5)	07(7.0)	14(4.7)	0.016
Labour augmentation	11(5.5)	14(14.0)	25 8.3)	0.001
Dystocia	12(6.0)	07(7.0)	19(6.3)	0.035
Pre-eclampsia	05(2.5)	02(2.0)	07(2.3)	0.355
Eclampsia	02(1.0)	00(0.0)	02(0.7)	0.554
Prolonged 2 <sup>nd</sup> stage	01(0.5)	00(0.0)	01(0.3)	1.000
Birth canal trauma	19(9.5)	16(16.0)	35(11.7)	0.126
Episiotomy	00(0.0)	01(1.0)	01(0.3)	0.333
PPH	02(1.0)	03(3.0)	05(1.7)	0.338

Table 7: Overall quality of care and APOs.

**SOCIO-DEMOGRAPHIC CHARACTERISTICS AND APOs**

One hundred and six participants, (35.3%) were single while 194(64.7%) were married. Being single was associated with seven APOs as summarized in Table 8.

**TEENAGE/NON-TEENAGE PREGNANCY AND ADVERSE PREGNANCY OUTCOME**

Thirty participants (10%) were teenagers while 270(90%) were non-teenagers. Being a teenager was associated with seven adverse pregnancy outcomes as summarized in Table 9.

APO	Single (N=106)	Married (N=194)	Total (N=300)	P-value
Preterm	28(26.4)	24 (12.4)	52 (17.3)	0.002
Low BW	23(21.7)	23 (11.9)	46 (15.3)	0.029
Still birth	09(8.5)	08 (4.1)	17 (5.7)	0.126
Low APGAR	24(22.6)	22 (11.3)	46 (15.3)	0.012
Labour Induction	06(5.7)	08 (4.0)	14 (4.7)	0.019
Labour augmentation	10(9.4)	15 (7.7)	25 8.3)	0.010
Dystocia	09(8.5)	10 (5.2)	19 (6.3)	0.015
Birth canal trauma	21(19.8)	14 (7.2)	35 (11.7)	0.002

Marital Status and Adverse Pregnancy Outcomes

Table 8: Marital Status and APOs.

APO	Teenager (<20years) (N=30)	Non-Teenager (≥20years) (N=270)	Total (N=300)	P-value
Preterm	12(40.0)	40(16.0)	52(17.3)	0.002
Low BW	13(43.3)	33(13.2)	46(15.3)	0.0001
Still birth	06(20.0)	11(4.4)	17(5.7)	0.003
Low APGAR	12(40.0)	34(13.6)	46(15.3)	0.001
Congenital anomaly	00(0.0)	01(0.4)	01(0.3)	0.845
Birth Injury	00(0.0)	01(0.4)	01(0.3)	1.000
Post term	01(3.3)	01(0.4)	02(0.7)	0.191
Macrosomia	00(0.0)	08(3.2)	08(2.7)	1.000
Labour Induction	02(6.6)	12(4.8)	14(4.7)	0.570
Labour augmentation	06(20.0)	19(7.6)	25 8.3)	0.020
Dystocia	05(16.7)	14(5.6)	19(6.3)	0.021
Pre-eclampsia	00(0.0)	07(2.8)	07(2.3)	0.633
Eclampsia	00(0.0)	02(0.8)	02(0.7)	1.000
Prolonged 2 <sup>nd</sup> stage	00(0.0)	01(0.4)	01(0.3)	1.000
Birth canal trauma	05(16.7)	30(12.0)	35(11.7)	0.369
Episiotomy	01(3.3)	00(0.0)	01(0.3)	0.003
PPH	00(0.0)	05(2.0)	05(1.7)	0.452

Table 9: Teenage/Non-teenage Pregnancy and APOs.

**CORRELATION BETWEEN GESTATIONAL AGE AT START OF ANC AND OVERALL QUALITY OF CARE SCORE**

As shown in Figure 1, there was a strong negative correlation between GA at start of ANC and overall adequate care score, implying that the earlier ANC was started, the more likely the woman was going to receive adequate care and *vice versa*. With Pearson correlation coefficient of -0.599, this observation was statistically significant (p-value< 0.001).

**DISCUSSION**

The aim of this study was to assess the quality of ANC and the outcome of pregnancy. It also aimed at finding out the

relationship between certain socio-demographic characteristics and pregnancy outcome.

Ninety nine percent of women attended at least one ANC visit. This result is the same as that obtained by Halle and colleagues in Buea Health District<sup>21</sup> but higher than 94% shown by Ziyu and colleagues in Benghazi.<sup>27</sup> This discrepancy in findings could be attributed to factors such as the geographical location, religion, study setting, clinical characteristics of the study population and study designs.

The mean gestational age at start of ANC was 19.2±4.2 weeks. This result concurred with that of previous studies.<sup>7,28,29</sup> Other studies show that mean gestational age at start of ANC was lower, (<16 weeks gestation).<sup>30,31</sup> But the mean age at start of ANC shown by other studies was higher, (>20 weeks gestation).<sup>28,29</sup> Difference in study setting, time when the studies were carried out, and study design are some of the reasons that account for the difference in the results we obtained and that seen in other studies.

Only 15.5% started ANC early. This result is similar to the study by Banda, et al.<sup>28</sup> but this was different from the results obtained by Halle and colleagues<sup>21</sup> in Buea which revealed a higher proportion of women who started ANC in the first trimester (27.2%). Other studies showed higher proportions of early ANC attendance.<sup>18,20,27</sup> This disparity can be accounted for by difference in study design, time of study and the motivation of the community.

Fifty eight percent of women attended four or more antenatal consultations. This result concurred with that of previous studies,<sup>10,20</sup> but was contrary to other studies which showed a lower percentage,<sup>18,19,27</sup> and different from that obtained by Halle and colleagues which showed that a higher proportion attended four or more visits in rural population, and even higher in a semi-urban population.<sup>28</sup> Again, this disparity can be accounted for by study design, sample size, study population, location, and time of study.

There was a correlation between two socio-demographic characteristics (being single, and being a teenager) and some adverse pregnancy outcome.

Teenagers were more likely to suffer preterm births, low birth weight, low APGAR score, labor augmentation, dystocia, and episiotomy than their non-teenage counterparts. This result is similar to that obtained in previous studies,<sup>32,33</sup> but contrary to the result in the studies which showed no difference in birth weight between the two groups.<sup>34</sup> This discrepancy in findings could be attributed to factors such as the geographical location and the clinical characteristics of the study population.

Single women were more likely to suffer from preterm births, low birth weight, low APGAR score, induction of labor,

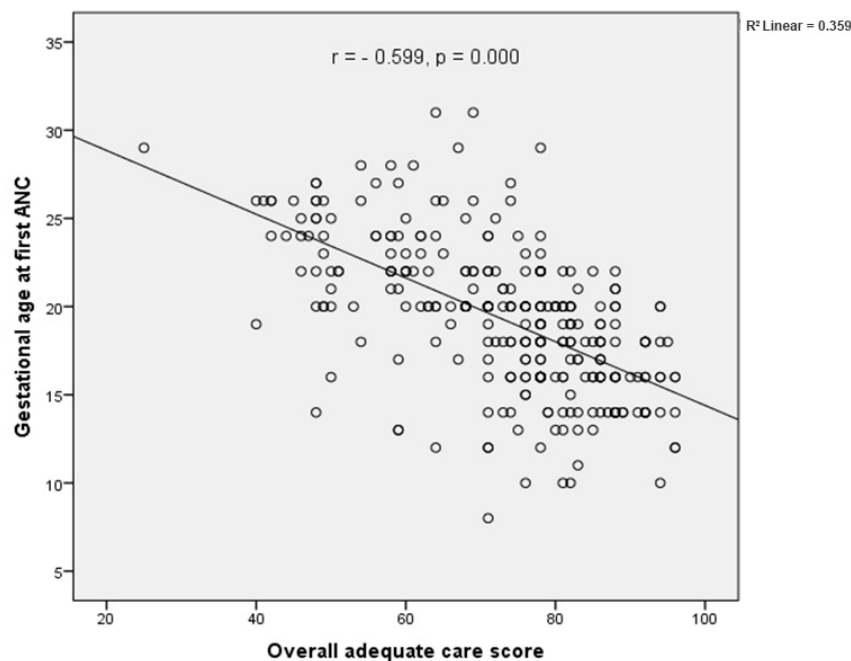


Figure 1: Correlation between GA at start of first ANC and overall adequate care score.

augmentation of labor, dystocia, and birth canal trauma than their married counterparts. This result is similar to that obtained in previous studies,<sup>34-36</sup> this result is different from that obtained in other studies which showed no difference in dystocia, birth canal trauma between the two groups.<sup>37</sup>

Most of the women (86.4%) did appropriate laboratory investigations. Women who did not do the appropriate laboratory investigations were more likely to suffer from preterm births, low birth weight, stillbirth, and low APGAR score than their counterparts who did appropriate laboratory investigations. This result is similar to that obtained by Tayebi and colleagues,<sup>13</sup> but contrary to that obtained by Raushan and colleagues.<sup>7</sup> This disparity can be accounted for by difference in study population, study design, sample size, study setting, and study period.

Inadequacy of preventive care, health promotion, and preparation for delivery were independently associated with adverse pregnancy outcomes. Since these components are included in overall quality of care, the difference in outcome will be discussed with respect to overall care. Besides, the studies reviewed compared only one or two adverse pregnancy outcomes and overall adequate care.

Adequate care was found in 66.7% of women. This result is similar to with that obtained in a previous study.<sup>11</sup>

There was a statistically significant difference in adverse pregnancy outcomes between those who had adequate care and those who had poor care. Those who had poor care were more likely to suffer from preterm birth, low birth weight, still birth, low APGAR score, post term birth, induction of la-

bor, augmentation of labor, and dystocia. This result is similar to that obtained in similar studies,<sup>13,27,38</sup> however most studies compared adequacy of care and one or two adverse outcomes. Regina and colleagues<sup>38</sup> showed an association between low birth weight and inadequate care but did not find any association between poor care and the other adverse outcomes.

Women who started ANC early were more likely to have an overall adequate care. This result is in accordance with that obtained in a previous study,<sup>11</sup> but is different from that obtained in another study<sup>16</sup> where there wasn't a difference in the two groups. This is because women can start ANC early but end up attending less ANC visits without carrying out the activities and procedures done during ANC.

#### STUDY LIMITATIONS

This was a hospital based study that included pregnant women who came to give birth in the three hospitals. It did not take into account a considerable number of women who gave birth at home. Furthermore, the study was carried out in two towns and only three hospitals in Fako Division so the results obtained might not represent the situation in this Division. Part of the data was obtained from records filled by other health personnel (those who conducted childbirths and those who carried out ANC) with a possibility that some data of these records was not correctly documented.

#### CONCLUSION

Adverse pregnancy outcomes in this region were associated with poor quality ANC. Therefore, sensitizing women

on the benefits of quality ANC, better health care services with well-trained health care personnel, research to find out more precise diagnosis of causes of adverse fetal and maternal outcome will lead to decrease fetal and maternal morbidity and mortality in this population.

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#### COMPETING INTERESTS

The corresponding author is a member of the Editorial Board of this journal but the article went through the peer-review process before publication. The other authors do not have any competing interests.

#### AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration with all authors. Authors GEHE, MCF and PNN did the study design and wrote the protocol and manuscript. Authors JA, NNB and TEO, did the literature search, cross-checked the statistical analysis and made important inputs in the drafting of the manuscript. DSN cross-checked the data entry and verified the statistical analysis while MCF analyzed the data. GEHE is the corresponding author. All authors read and approved the final manuscript.

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