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## ORIGINAL ARTICLES

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### Prenatal care utilization and foetal outcomes at Harare Maternity Hospital, Zimbabwe

\*\*J GALVAN, #G B WOELK, ##K MAHOMED, \*N WAGNER, ##S MUDZAMIRI, \* MA WILLIAMS

#### Abstract

**Objectives:** To examine the association between adverse infant outcomes and maternal under utilization of prenatal care, among women delivering at Harare Maternity Hospital.

**Design:** Hospital based, cross sectional study.

**Setting:** Harare Maternity Hospital, Harare, Zimbabwe.

**Subjects:** A random sample of 3 864 pregnant women.

**Main Outcome Measures:** Prenatal care utilization, maternal socio-demographic information, as well as birth weight and other neonatal outcome characteristics.

**Results:** Of the total number of women who participated in this study 3 491 (90%) had at least one prenatal care visit. Women receiving no prenatal care, were more likely to be younger, unmarried and to have been transferred for delivery as compared with women receiving prenatal care. Women receiving no prenatal care were seven times more likely to deliver an infant weighing less than 1 500 grams, adjusted odd ratio (OR) = 7.22; 95% confidence interval (CI) 4.58 to 11.39 as compared with those who booked for care. Newborns of unbooked mothers were more likely to have a low apgar score at birth, adjusted OR = 1.71; to have been admitted to the neonatal intensive care unit, adjusted OR = 2.14, and to require intubation, adjusted OR = 3.35. A large proportion of women (31.4%) initiated prenatal care after 30 weeks gestation.

**Conclusions:** There were significant differences between maternal characteristics and foetal outcomes in relation to booking status. Under utilization of prenatal care was associated with sub-optimal foetal outcomes. Improving the socio-economic status of women, their education and access to health care, and family planning methods are all strategies that should contribute to the reduction of adverse foetal outcomes.

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#### Introduction

Under utilization of prenatal care continues to be of particular concern throughout most of the developing

world. Infant low birth weight, premature delivery, stillbirths, as well as infant and maternal mortality, have long been associated with poor maternal care.<sup>1-5</sup> At present, results from studies in developing countries indicate that

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\*Departments of Epidemiology and \*\*Health Services  
University of Washington School of Public Health and Community  
Medicine  
Seattle  
USA

#Departments of Community Medicine  
##Obstetrics and Gynaecology  
University of Zimbabwe Medical School  
P O Box A 178  
Avondale, Harare, Zimbabwe

Correspondence to :  
Dr Godfrey B Woelk  
Department of Community Medicine  
University of Zimbabwe Medical School  
PO Box A 178  
Avondale  
Harare, Zimbabwe

even if the chances for having an adverse maternal and foetal outcome cannot be eliminated, the risk of adverse outcomes can be reduced, in part, through the provision of affordable prenatal care services.<sup>6</sup> Overall, only 65% of women in developing countries receive any prenatal care during pregnancy, 63% in Africa, 65% in Asia, and 73% in Latin America and the Caribbean. Poor women in sub-Saharan Africa and South Asia receive the least amount of prenatal care.<sup>7</sup>

In sub-Saharan Africa, under utilization of prenatal care has been associated with poor access to health care facilities, worsening economic situation, women's lack of awareness about the best time to initiate care, as well as lack of decision making power within the family. Other factors that contribute to under utilization of care include poor quality of services, and fear of exposure to disrespectful health workers.<sup>7</sup>

Unplanned pregnancies,<sup>8</sup> lower educational attainment,<sup>9,10</sup> low socio-economic status,<sup>11</sup> and belonging to a minority ethnic group,<sup>12</sup> are characteristics that have been associated with pregnant women delaying or not receiving prenatal care in the United States. Controversy exists regarding the timing of the first and total number of visits. The American College of Obstetricians and Gynaecologists (ACOG) recommends that the first visit should be within the first trimester, while the Royal College of Obstetricians and Gynecologists (RCOG) of Great Britain recommends initiating prenatal care visits after 12 weeks.<sup>13</sup> In Zimbabwe obstetricians recommend that the first prenatal visit should take place within the first 16 weeks, the second visit four weeks later, and the subsequent visits approximately monthly thereafter, up to six visits for uncomplicated pregnancies; 24 to 28 weeks, 32 to 34 weeks, 36 to 38 weeks and 38 to 42 weeks.<sup>14</sup>

Fawcus *et al*,<sup>15</sup> and Tshimanga *et al*,<sup>13</sup> assessed the relation between prenatal care and pregnancy outcomes in two separate studies of Zimbabwean women. Results suggested that mothers who do not receive prenatal care during pregnancy were more likely to have poor maternal and foetal outcomes than those who received care.<sup>15</sup> We conducted a descriptive epidemiological study of the characteristics of those women who did and did not receive prenatal care during pregnancy. We also reassessed the risk of adverse foetal outcomes associated with prenatal care under utilization.

## Materials and Methods

This study was conducted at Harare Maternity Hospital in Harare, Zimbabwe. Harare Maternity Hospital is a referral hospital, and is part of what is known as the Greater Harare Unit. The Greater Harare Unit is comprised of nine clinics located in the high density suburbs of the city. These clinics are primarily used for low risk deliveries. High risk deliveries are referred to Harare Maternity Hospital, but some women who live in the urban and semi-urban areas surrounding the hospital use it as a primary health care facility as well. The majority of patients receiving care at

this hospital come from poor communities and often migrate between urban and semi-urban areas. In 1997, the Greater Harare Maternity Unit delivered 38 006 babies, 15 539 (41%) of which were delivered at Harare Maternity Hospital.<sup>16</sup>

A cross sectional descriptive epidemiological study was conducted from June 1996 to March 1998. All women delivering at the hospital, and who were capable of granting informed consent were eligible for enrollment in this study. Each morning during the enrollment period, eligible subjects were numbered in the order in which they were admitted for labour and delivery. The first five to 10 women admitted each day were approached and invited to participate in the study. If a particular subject was too ill or not willing to participate in the research, the next person on the list was approached and invited to participate in the study. A total of 4 009 eligible women were enrolled in the study. Women with multiple pregnancies were excluded from this analysis, resulting in a total of 3 684 subjects remaining in the final analytical data set. Data were collected by a research nurse and a nursing student. Maternal and infant medical records were reviewed, and detailed information on *antepartum* events including gestational age at onset of prenatal care, and medical complications were collected. Information concerning labour and delivery characteristics and condition of the newborn was also abstracted from medical records. Gestational age at delivery was defined as the final estimate recorded by the physician or nurse who attended the delivery. This paper reports on the analysis of these records, which formed part of the original data set.

Women were classified as having been booked or unbooked for prenatal care. Booked women were those mothers who received some prenatal care from a physician or midwife, either at Harare Maternity Hospital or at one of the nine local health clinics, before referral for labour and delivery for the index pregnancy. Unbooked women were those mothers who received no prenatal care at any of the clinical settings mentioned above. Booked mothers were further divided according to the gestational age at booking: early bookers (the first prenatal visit before the 24th week of gestation), late bookers (the first prenatal visit between the 25<sup>th</sup> and 29<sup>th</sup> week of gestation), and very late bookers (when the first *antenatal* visit occurred after the 30<sup>th</sup> week of gestation). These cut off points were, in part, based in definitions used previously by other investigators.<sup>13,15,17</sup>

Statistical analyses were performed using Epi Info and SAS software. The distribution of maternal characteristics and neonatal outcomes were examined for booked and unbooked mothers. For all categorical variables, the Chi squared test statistic was used to assess any statistically significant differences in the distribution of study subjects. The odds ratio (OR) was used to measure the association between adverse pregnancy outcome in relation to prenatal care utilization. Logistic regression procedures were used to derive maximum likelihood estimates of OR and their 95% confidence interval (CI), adjusted for potential confounding factors. These included maternal age, marital

status, parity, prior history of abortion or stillbirth, and medical transfer status. Adjustment for marital status and history of abortion or stillbirth, did not result in an increase or decrease in the OR by 10% or more according to Greenland,<sup>18</sup> so we did not include these covariates in final logistic regression models.

This investigation was approved by the Medical Research Council of Zimbabwe and the Human Subjects Committee of the University of Washington Medical Center. All subjects gave informed consent prior to participating in this research.

## Results

Approximately 90% of study subjects had at least one prenatal care visit (3 491 of 3 864 subjects). Three hundred and sixty nine subjects received no prenatal care (9.5%). The remaining five subjects (0.1%) could not be classified as prenatal care booked or unbooked. Demographic and medical characteristics of booked and unbooked mothers are presented in Table I. Women who received prenatal care tended to be older and more likely to have had a prior history of abortion and stillbirth, respectively, as compared with women who received no prenatal care. Women who received no prenatal care were less likely to be married, and were more likely to have been transferred from clinics in the Greater Harare Unit to Harare Maternity Hospital for labour and delivery, as compared with those who received prenatal care.

Table I: Maternal characteristics of booked and unbooked mothers delivering at Harare Maternity Hospital, Harare, Zimbabwe, 1996 to 1998.

Characteristics	Booked (n= 3 491)		Unbooked (n=369)	
	n	%	n	%
Maternal age (years)*				
<20	678	19.4	104	28.2
20-24	1 296	37.1	138	37.4
25-29	798	22.1	69	18.7
30-34	407	11.7	32	8.7
≥ 35	296	8.5	21	5.7
Maternal age (years)**	25.1 ± 7.8		24.4 ± 10.3	
Nulliparous	1 571	45.0	176	47.7
Unmarried*	59	1.7	24	6.5
Prior abortion***	253	12.7	13	6.5
Prior stillbirth***	121	6.0	6	3.0
Maternal transfer*	687	19.7	101	27.4

\*p < 0.05.

\*\*Mean ± SD.

\*\*\*Analysis restricted to women who had at least one previous pregnancy.

Table II summarizes the characteristics of subjects according to the gestational age at which they initiated prenatal care. In this study population, only 61 subjects (1.6%) initiated prenatal care during the first trimester (i.e., less than 12 weeks gestation). Using similar cut off points that were previously used by investigators studying Zimbabwean women,<sup>13,15,17</sup> we noted that 30.4% of women

initiated care before the 25<sup>th</sup> week of gestation. Approximately 22% and 31% of women initiated prenatal care during the 25<sup>th</sup> to 29<sup>th</sup> or after the 30<sup>th</sup> week of gestation, respectively. The gestational age at prenatal care onset was unknown for 7.2% of study subjects. Women who initiated prenatal care after 30 weeks of gestation were more likely to be unmarried as compared with women who initiated care earlier in pregnancy. The frequency distribution for other maternal characteristics according to gestational age at prenatal care initiation is presented in Table II.

Table II: Maternal characteristics according to gestational age at booking for prenatal care: "Early", "Late", "Very Late" and "Unknown", Harare Maternity Hospital, Harare, Zimbabwe, 1996 to 1998.

Characteristics	Early (n=1 173)		Late (n=831)		Very late (n=1 212)		Unknown (n=278)	
	n	%	n	%	n	%	n	%
Maternal age (years)								
<20	235	20.0	148	17.8	234	19.3	61	21.9
20-24	478	40.8	290	34.9	437	36.1	92	33.1
25-29	257	21.9	216	26.0a	252	20.8	73	26.3
30-34	116	9.9	110	13.2a	153	12.6	28	10.1
≥35	82	7.0	63	7.6	130	10.7b	22	7.9
**Maternal age (years)	24.5 ± 7.5		25.3 ± 7.7		25.5 ± 8.2		25 ± 8.6	
Unmarried	9	0.8	12	1.4	32	2.6 <sup>b</sup>	6	2.2 <sup>c</sup>
Nulliparous	592	50.5	360	43.3	507	41.8	114	41.0
Prior abortion*	124	19.6	64	13.2 <sup>a</sup>	49	6.9	16	9.4 <sup>c</sup>
Prior stillbirth*	43	6.8	32	6.6	37	5.2	9	5.3
Maternal transfer	187	15.9	180	21.7 <sup>b</sup>	230	19.0	90	32.4 <sup>c</sup>

Early = first prenatal visit before 25 weeks gestation; Late = first prenatal visit between 25 to 29 weeks of gestation; Very late = first prenatal visit after 30 weeks gestation.

<sup>a</sup>p value for Late vs. early <0.05.

<sup>b</sup>p value for Very Late vs Early <0.05.

<sup>c</sup>p value for unknown vs. Early <0.05.

\*Analysis restricted to women who had at least one previous pregnancy.

\*\*Mean ± SD.

Table III summarizes the relationship between maternal prenatal care utilization status and risk of adverse foetal outcomes. Women who received no prenatal care were three times more likely to deliver a low birth weight infant as compared with those who received prenatal care (unadjusted OR = 3.00; 95% CI 2.36 to 3.81). After adjusting for maternal age, parity, marital and transfer status, the risk of low birth weight remained three fold higher for women receiving no prenatal care in comparison to those who booked for care (adjusted OR = 3.30; 95% CI 2.37 to 3.87). Unbooked mothers were 7.2 times more likely to deliver a very low birth weight infant (birth weight < 1 500 gms) as compared with those who received prenatal care (adjusted OR = 7.22; 95% CI 4.58 to 11.39). Unbooked mothers were 3.9 times more likely to deliver a preterm infant (adjusted OR = 3.90; 95% CI 3.08 to 4.96) as compared with those mothers who booked for care. The risk of delivering a very preterm infant (i.e. <35 weeks of gestation) was fivefold higher for unbooked as compared with booked mothers (adjusted OR = 5.40; 95% CI 4.08 to 7.14). Infants of women who received no prenatal care

were more likely to have low one and five minute apgar scores (scores <7), (adjusted OR 1.71 and 2.66, respectively), and were also more likely to require admission to the neonatal intensive care unit and intubation (adjusted ORs = 2.14 and 3.35, respectively). Although limited by the small number of subjects, it appeared that women receiving no prenatal care were two times more likely to have delivered an infant with a congenital anomaly as compared to those who received prenatal care (OR adjusted for maternal age = 2.09; 95% CI 0.70 to 6.25).

### Discussion

In the sample of women who gave birth at Harare Maternity Hospital, young, unmarried mothers, and those who required transfer, were more likely to have received no prenatal care. Newborns of women who received no prenatal care were more likely to have been low birth weight, to have been born preterm, and to have experienced adverse neonatal events. Young mothers were more likely to have not received prenatal care. Single women and those women who were transferred from other local clinics were less likely to have received any prenatal care. Our findings of an over representation of young, single women among those not receiving prenatal care is in general agreement

with results reported by Fawcus *et al.*<sup>15</sup> The investigators reported an association between single marital status, young maternal age (<24 years of age), parity of two or less, and under utilization of prenatal care. Findings from studies conducted in North America and Europe are similar to our observations. Results of a study conducted in Minnesota,<sup>19</sup> revealed that unmarried adolescents were nearly 10 times more likely to have not received prenatal care as compared to married women. In France, women with no prenatal care were significantly younger (<25 years) than women who had one or two visits during pregnancy.<sup>20</sup>

Essex *et al* in New Zealand,<sup>21</sup> noted that unmarried women were more likely to receive prenatal care late during pregnancy (after 12 weeks) as compared with married women (27% versus 9.5%). Similarly, Thomas and colleagues, in a study group of 13 127 mothers, reported that unmarried women were more likely (33.5%) to initiate prenatal care visit after the 28<sup>th</sup> week of pregnancy as compared with married women (6.2%).<sup>22</sup> We did not collect detailed economic status information from study participants. Results from previous investigations conducted in Zimbabwe, however, suggest that low socio-economic status is an important determinant for under utilization of prenatal care services.<sup>13,15</sup> Other observations

Table III: Infant birth weight, gestational age and other perinatal characteristics of booked and unbooked mothers delivering at Harare Maternity Hospital, Harare Zimbabwe, 1996 to 1997.

Foetal Outcome Characteristics	Booked (n=3 491)		Unbooked (n=369)		Unadj OR (95%CI)	Adj OR (95% CI)
	n	%	n	%		
Infant birth weight (gms)***	2 993 ± 544		2 658 ± 735			
>=2500	3 007	86.2	248	67.4	1.0	1.0*
<2500	481	13.8	119	32.4	3.00 (2.36-3.81)	3.03 (2.37-3.87)
1500-2499	423	12.1	85	23.1	2.44 (1.87-3.18)	2.46 (1.87-3.23)
<1500	58	1.7	34	9.2	7.11 (4.57-11.0)	7.22 (4.58-11.39)
Gestational age at delivery (weeks)****	39 ± 2.7		36.3 ± 4.5			
>=37	3 009	86.2	224	60.9	1.0	1.0*
<37	469	13.4	135	36.7	3.87 (3.06-4.89)	3.90 (3.08-4.96)
35-36	231	6.6	40	10.9	2.33 (1.62-3.34)	2.36 (1.63-3.40)
<35	238	6.8	95	25.8	5.36 (4.08-7.05)	5.40 (4.08-7.14)
Apgar score at 1 min.						
>=7	2 876	82.4	272	73.9	1.0	1.0*
<7	609	17.4	95	25.8	1.65 (1.29-2.12)	1.71 (1.32-2.21)
Apgar score at 5 min.						
>=7	3 339	95.7	332	90.2	1.0	1.0*
<7	146	4.2	36	9.8	2.48 (1.69-3.63)	2.66 (1.80-3.93)
Neonatal admission						
No	2 890	82.8	259	70.4	1.0	1.0*
Yes	594	17.0	109	29.6	2.05 (1.61-2.60)	2.14 (1.67-2.74)
Intubation required						
No	3 444	98.7	355	96.5	1.0	1.0*
Yes	39	1.1	12	3.3	2.99 (1.55-4.75)	3.35 (1.72-6.49)
Congenital anomaly						
No	3 470	99.4	364	98.9	1.0	1.0**
Yes	18	0.5	4	1.1	2.12 (0.71-6.29)	2.09 (0.70,6.25)

†p<0.001.

\*Adjusted for maternal age, parity, marital and transfer status.

\*\*Adjusted for maternal age.

\*\*\*Mean ± SD.

from the United States,<sup>8</sup> and Jamaica,<sup>23</sup> indicate that poor women are at higher risk for having adverse foetal outcomes. Taken together, these results suggest that the association between adverse pregnancy outcome and under utilization of prenatal care may be mediated in part by poverty. Tshimanga *et al*<sup>13</sup> reported that the primary reason for women delaying the initiation of *antenatal* care in Zimbabwe was lack of money (40% early bookers, 56% late bookers).

We noted that women with a prior abortion or stillbirth were more likely to initiate prenatal care before the 25<sup>th</sup> week of gestation. This trend was also observed by Tshimanga *et al* in Zimbabwe,<sup>13</sup> and Elam-Evans *et al* in Georgia.<sup>24</sup> Both groups of investigators reported that women with a previous poor obstetric history were more likely than women without such histories to seek prenatal care in a subsequent pregnancy. A number of studies have shown that women with poor prenatal care are at higher risk of having adverse foetal outcomes.<sup>1,4,25</sup> Our study showed that women receiving no prenatal care experienced a 7.22 fold increased risk of delivering a <1 500 gms birth weight infant as compared with those women who received prenatal care. A similar association was also found by Hamilton *et al* in South Africa,<sup>26</sup> and Fawcus *et al* in Zimbabwe. This association is also similar to that observed by Petersen *et al* in Minnesota.<sup>19</sup> Women with poor and no prenatal care were twice as likely to deliver a low birth weight infant as compared with women who received adequate prenatal care. In their study, women from all ethnic minority groups, i.e., African American, Native American and non-White Hispanics, were two times more likely to have no or inadequate prenatal care, as compared with White women.<sup>19</sup> The characteristics of women not receiving prenatal care in the United States and Zimbabwe are similar. Young maternal age, low socio-economic status, low educational attainment, as well as poor access to prenatal care services have been associated with prenatal care under utilization.<sup>10,19</sup>

Very preterm delivery (delivery before the 35<sup>th</sup> week of gestation), apgar scores below seven at one and five minutes, as well as neonatal admission to intensive care units were noted to occur more frequently among infants borne to mothers receiving no prenatal care as compared to those born to mothers who received care. These findings are corroborated by several previous studies.<sup>15,23</sup> Results of a study done in Jamaica showed that unbooked mothers were nearly two times more likely to deliver preterm as compared with women receiving some prenatal care.<sup>23</sup> A similar association was observed by Fawcus *et al* in Zimbabwe.<sup>15</sup> The investigators reported an association between preterm deliveries and low birth weight infants with mothers not receiving prenatal care.

Several limitations of our study need to be taken into consideration. Information was abstracted from medical records, and so they may have been subject to reporting and recording errors. The potential for limitation, however, was reduced by careful supervision and frequent random double-checking of abstracted information by a highly

qualified and well trained research nurse. There is likely to have been measurement error in the specification of gestational age at delivery. To minimize any systematic error, the medical records abstractor was instructed to record gestational age at delivery as determined by the clinical staff attending to the patient. Another limitation relates to our inability to distinguish between spontaneous and induced abortions. We could not evaluate the relationships between the two types of abortion and adverse neonatal outcomes independently. The results observed from patients delivering at Harare Maternity Hospital may also not be generalizable to all obstetric patients in Harare.

Overall, our findings are similar to those described earlier by other investigators. Although we found an association between under utilization of prenatal care and adverse foetal outcomes, prenatal care utilization is but one determinant of pregnancy outcome. Prenatal care utilization alone is unlikely to reduce the risk for adverse foetal outcomes. Existing clinical and epidemiological literature suggest that prenatal care is an integral component of a multi-faceted integrated approach for health maintenance and the early detection and treatment of pregnancy complications. Improving the socio-economic status of women, and increasing their access to health care, and family planning methods are all strategies which together with prenatal care should contribute to the reduction of adverse foetal outcomes.

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