ORIGINAL RESEARCH ARTICLE

First trimester antenatal care visit reduces the risk of miscarriage among women of reproductive age in Ghana

DOI: 10.29063/ajrh2021/v25i1.15

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Abstract

Miscarriage is a common adverse pregnancy outcome in childbearing and an increasing global reproductive health problem. This study explored 1) the national prevalence of the first trimester (≤12 weeks) miscarriage among women (15-49 years) in Ghana, and 2) the influence of first-trimester antenatal care (ANC) visits on miscarriage risk. A cross-sectional study using the Demographic Health Survey (DHS- 2017) on maternal health in Ghana was conducted. We used a nationally representative subsample of (7,846) women with no or early ANC visit of the initial sample (25,062). Women with late ANC visit (≥12 weeks) and those who were never pregnant or had not given birth at the time of the survey were excluded from this analysis. We performed multivariable Poisson regression to estimate miscarriage risk (RR), its associated risk factors, and national prevalence. The national first-trimester miscarriage prevalence was 19.1%. Increasing maternal age and urban residence were significantly associated with the risk of first-trimester miscarriage (p<0.001) while early ANC visits lower the risk of miscarriage by 43% (p=0.0246). We found that first trimester ANC visit decreases miscarriage risk in Ghana and highlights the important role of early ANC visits in reducing miscarriages. *(Afr J Reprod Health 2021; 25[1]: 129-137).*

Keywords: Antenatal care visit, Ghana, miscarriage, pregnant women, prevalence

Résumé

La fausse couche est une issue défavorable courante de la grossesse lors de la procréation et un problème mondial croissant de santé reproductive. Cette étude a exploré 1) la prévalence nationale des fausses couches au premier trimestre (≤12 semaines) chez les femmes (15-49 ans) au Ghana, et 2) l'influence des consultations prénatales (CPN) du premier trimestre sur le risque de fausse couche. Une étude transversale utilisant l'enquête démographique et sanitaire (EDS-2017) sur la santé maternelle au Ghana a été menée. Nous avons utilisé un sous-échantillon représentatif au niveau national de (7 846) femmes sans visite prénatale ou prénatale de l'échantillon initial (25 062). Les femmes avec une consultation prénatale tardive (≥ 12 semaines) et celles qui n'étaient jamais enceintes ou n'avaient pas accouché au moment de l'enquête ont été exclues de cette analyse. Nous avons effectué une régression de Poisson multivariée pour estimer le risque de fausse couche (RR), ses facteurs de risque associés et la prévalence nationale. La prévalence nationale des fausses couches au premier trimestre était de 19,1%. L'augmentation de l'âge maternel et de la résidence urbaine était significativement associée au risque de fausse couche au premier trimestre (p <0,001), tandis que les visites prénatales précoces réduisent le risque de fausse couche de 43% (p = 0,0246). Nous avons constaté que la visite prénatale du premier trimestre diminue le risque de fausse couche au Ghana et souligne le rôle important des visites prénatales précoces dans la réduction des fausses couches. *(Afr J Reprod Health 2021; 25[1]: 129-137).*

Mots-clés: Visite de soins prénatals, Ghana, fausse couche, femmes enceintes, prévalence

Introduction

Miscarriage and stillbirth are the most common adverse pregnancy outcomes in childbearing. They have aggravating emotional consequences for individuals and affected families. Accurate estimates in miscarriage rates are difficult to achieve and it is a challenging endpoint to ascertain[1,2]. Although identified as a considerable public health issue it has been insufficiently investigated especially in sub-Saharan African Countries[1,2]. Traditional risk factors such as maternal age, smoking, alcohol consumption, excessive weight, previous miscarriage, and cervical problems have only been investigated elsewhere[1]. Methodological complexities such as

the confirmation of suspected pregnancy, identifying a representative sample of pregnancies at the time of conception, and the determination of the exact timing of pregnancy loss makes it difficult to assess miscarriage rates[3]. Miscarriages have a greater economic and mental health or psychological (e.g depression, elevated anxiety) burden on families than normal birth[4]. Psychological symptoms could persist for 6 months to 1 year after miscarriage[4]. Predisposing factors for psychological morbidity among women of childbearing age include a history of psychiatric illness, childlessness, lack of social support, poor marital adjustment and prior pregnancy loss[4].

However, unlike in postpartum depression, simple and effective screening measures for psychological morbidity in the context of miscarriage have not been well established with a substantial lack of studies in this subject matter in the African context. Additionally, not so well documented is the moderating role of antenatal care (ANC) visits on miscarriage risk. Epidemiological studies suggest that no or low ANC services utilization is associated with adverse health outcomes such as maternal deaths, stillbirths or miscarriage[5–8]. ANC services are an essential part of basic primary healthcare offered to mothers and unborn children during pregnancy. These services have a mandate to prevent, detect and treat risk factors early in the pregnancy. Central to that mandate is the ability to detect high-risk pregnancies through the analysis of socioeconomic, medical and obstetrical factors. ANC services provide additional interventions such as immunisation, nutrition programs, breastfeeding counseling, family planning options, and birth spacing, all of which have been shown to positively influence maternal and child health status[9–13]. Thus, ANC services are a potentially important determinant in reducing maternal and child morbidity and mortality[14–17]. Though the World Health Organization (WHO) recommends initiation of ANC during the first trimester, no or late first ANC presentations remain a major challenge in sub-Saharan Africa[17]. Besides, there are also geographical variations in the timing of ANC presentations between urban and rural settings within countries in sub-Saharan Africa[18,19]. Cultural beliefs, attitudes, and knowledge regarding pregnancy, history of obstetric complications, being unmarried and lack of education have been reported as determinants of no or late first ANC presentation[20–23]. Factors associated with no or late ANC presentation include availability, affordability, and accessibility of health care services[20–23]. An ANC visit is therefore seen as a relevant milstone to track the progress of reproductive health programs and their impact on maternal health[24,25].

Although the literature suggests most causes of miscarriage are biological, behavioral, genetic or nutritional, and that over 80% of most miscarriages occur in the first trimester of pregnancy[1,5,26], early intervention from ANC care services can help reduce the associated complication leading to its occurrence. A comprehensive understanding of the importance of an early ANC visit during the first trimester and the risk factors for miscarriages is potentially beneficial for both psychological and risk reduction interventions[4].

Most studies on miscarriage have been conducted in higher-income countries although few studies have recently been conducted in some low- and middle-income countries[27–29]. Aside from the scarcity of studies of miscarriage in low- and middle-income countries, research on miscarriage faces additional challenges as most miscarriages occur without any contact with the formal healthcare system and are not registered which may lead to underreporting[27–29].There is the need to promote the achievement of the UN Sustainable Development Goals by reducing the risk of miscarriage in Africa and Ghana in particular because of its importance for global public health[30].

To our knowledge, there exists no Ghanaian study which specifically estimates both the prevalence of miscarriage in the first trimester and the impact of first trimester (≤12 weeks) antenatal care (ANC) visits on miscarriages risk during pregnancy.

The existence of the Demographic and Health Surveys in Ghana provides the opportunity to quantify the insufficiently studied effects of first-trimester antenatal care services on miscarriages in Ghana. This study explored the prevalence, associated risk factors, and potential effects of first trimester ANC visits on miscarriages in Ghana.

The objectives of this study are to 1) estimate the national prevalence of first trimester (≤12 weeks) miscarriages among women in their reproductive ages (15–49 years) , and 2) explore the influence of first trimester (≤12 weeks) ANC visits on miscarriage risk among pregnant women.

Methods

Data source

We analyzed cross-sectional data from Ghana's maternal health from the 2017 Demographic Health Survey (DHS)[31,32]. This nationally representative survey was conducted using a two-stage stratified cluster probability sampling design[31] where data on maternal health-related issues from 25,062 women aged 15-49 in 26,324 households were collected between 15 June to 12 October 2017[31]. A total of 30 households were selected from each of the 900 nationwide clusters[31]. The selected women responded directly to questions from a structured questionnaire and self-reported various health outcomes. The topics covered included sociodemographic or background characteristics, family planning, pregnancy and postnatal care for most recent live birth or stillbirth, abortion, miscarriage, sexual activity, adult and maternal mortality, health care access, insurance and disability. The response rate was 99%. The survey received approval from Inner City Fund (ICF) Institutional Review Board[31].

Outcome variables

First trimester miscarriage (≤12 weeks miscarriage), the main outcome variable in this study, was measured by asking respondents the following question: "How many first trimester miscarriages have you had in your lifetime?"[31]. Responses ranged between (0–7). Those who responded zero were recoded as "No first trimester miscarriage" while those who responded between 1 and 7 were collapsed and recoded as one (1) and renamed "First trimester miscarriage" with 'No first trimester miscarriage' as the reference category. Missing responses were dropped during recoding.

Explanatory and other potential confounding variables

The main independent variable under investigation is antenatal visits in the first trimester. Respondents were asked how early (in months) they accessed ANC services before they had their first episode of miscarriage. Responses were recoded into a binary measure "no antenatal visit in the first trimester" and "antenatal visit in the first trimester". Individuals who had ANC visits after twelve weeks, those who were never pregnant or had not given birth at the time of the survey were not the focus of this study. This is because the risk of miscarriage is higher within the first three months of pregnancy and those who are within the reproductive age and had not given birth, were never pregnant or pregnancies over three months are not at a greater risk of miscarriage.

Several factors including maternal age, education, marital status, place of residence[33] and other care factors[34] have been showed to act as mediators and may influence the association between the primary outcome and the main independent variable thus these variables were controlled for in the present study. Age was categorized into four groups "15–22years", "23–29 years", "30–39 years" and "≥40 years" and education into two levels "no education" and "some education". The participant's place of residence was categorized into two levels (rural/urban). Marital status was assessed on three levels "currently married", "cohabitating" and "never married/single". Health insurance coverage was assessed on a "yes" or "no" basis. In addition, access to care factors including distance to a health facility, money for treatment, permission to see a doctor and not wanting to go alone were all measured on two levels "not a big problem" and "big problem".

Data analysis

The impact of antenatal care visits on the number of miscarriages was analyzed using Poisson regression[35]. The assumption of Poisson regression

Table 1: Demographic characteristics of respondents (aged 15–49 years) covered in the demographic health survey

Characteristics	N	(%)
First trimester ANC visits for pregnant women (≤12 weeks)		
No	26	0.10
Yes	7,820	31.2
Other (late and not given birth)	17,216	68.7
Total	25,062	100
Age categories, years		
15 – 22	7,461	29.77
23 – 29	5,885	23.48
30- 39	6,877	27.44
≥40	4,839	19.31
Total	25,062	100
Educational level		
No	6,508	25.97
Yes	18,554	74.03
Total	25,062	100
Marital Status		
Currently married	10,869	43.37
Cohabitating	4,183	16.69
Never married/single	10,010	39.94
Total	25,062	100
Area of residence		
Rural	12,518	49.95
Urban	12,544	50.05
Total	25,062	100
Distance to health facility		
Not a big problem	17,999	71.82
Big problem	7,063	28.18
Total	25,062	100
Covered by health insurance		
No	7,968	38.64
Yes	12,653	61.36
Total	20,621	100
Not wanting to go alone		
Not a big problem	20,695	82.58
Big problem	4,367	17.42
Total	25,062	100
Getting money for treatment		
Not a big problem	12,477	49.78
Big problem	12,585	50.22
Total	25,062	100
Getting permission		
Not a big problem	23,118	92.24
Big problem	1,944	7.76
Total	25,062	100

Table 2: Prevalence of miscarriages during first trimester (≤12 weeks) ANC visits among women aged 15-49 years

Variables	**N**	**Percentage**
Number of first trimester miscarriages	1492	-
Overall first trimester prevalence	1492/7820	**19.1%**

where the mean and variance are required to be equal to avoid the effect of overdispersion was checked for and was found to have been met[36]. Generalized estimating equations (GEEs) were employed to account for the clustering effect in the data[37]. Based on the smallest quasi information criteria (QIC), the exchangeable working correlation structure was selected for the study analysis[38]. The model-building approach of Hosmer et al was adopted[39]. All variables with a bivariate p-value <0.25 were included in the multivariate analysis[38]. A manual backward elimination strategy was used to select the most contributing ($p<0.05$) explanatory variables for the study's final multivariate model. A variable was considered a confounder if the difference between the adjusted and crude estimate was at least 20%[39].

Results

Table 1 summarizes the study population characteristics. More than a quarter (29.8%) of women were between 15–22 years of age and 27.4% were between 30-39 years of age. Nearly, three quarters (74%) of the study population had some formal education. The majority (60%) were either married or living with a man. Equal numbers lived in urban and rural areas. Almost all (99.7%) reported having had an ANC visit in the first trimester. The majority (61.4%) of women reporting the use of ANC services had health insurance. Distance to a health facility, not willing to go alone, and getting permission to see a doctor was reported as not a big problem for a substantial majority of the study population. In contrast, half of the women reported having a problem with money for treatment.

Table 1 shows that out of the 25,062 women surveyed, 7820 women representing 31.2% reported having had access to antenatal care visit in the first trimester. They reported first trimester miscarriages providing an estimated prevalence of lifetime first-trimester miscarriage rate in Ghana of 19.1% (Table 2). Unadjusted results from Table 3 show that women who had first-trimester antenatal care visit were at a 45% reduced risk of miscarriage compared to those who did not have an antenatal visit. Increasing age, in general, was significantly associated with miscarriages up to age 40.

Table 3: Unadjusted associations of socio-demographic, care factors and number of miscarriages

Variable	Unadjusted Relative risk	95%CI Lower	Upper	P-value
First trimester ANC visits for pregnant women (≤12 weeks)				0.0135[a]
No	Ref. category			
Yes	0.55	0.35	0.88	0.0135
Area of residence				<.0001[a]
Rural	Ref. category			
Urban	1.08	1.04	1.12	<.0001
Age categories, years				<.0001[a]
15 - 22	Ref. category			
23 - 29	1.08	1.04	1.13	0.0003
30- 39	1.16	1.11	1.22	<.0001[a]
≥40	0.94	0.88	1.01	0.0790
Educational level				0.0013[a]
No	Ref. category			
Yes	1.06	1.02	1.10	0.0013
Marital Status				<.0001[a]
Never married/single	Ref. category			
Cohabitating	0.97	0.93	1.02	0.2128
Currently married	0.93	0.89	0.97	0.0012
Distance to health facility (far)				0.0052[a]
Not a big problem	Ref. category			
Big problem	0.95	0.92	0.98	0.0052
Covered by health insurance				0.1334[a]
No	Ref. category			
Yes	1.03	0.99	1.07	0.1334
Not wanting to go alone				0.6244[a]
Not a big problem	Ref. category			
Big problem	0.99	0.95	1.03	0.6244
Getting money for treatment				0.1057[a]
Not a big problem	Ref. category			
Big problem	0.97	0.94	1.01	0.1057
Getting permission				0.9353[a]
Not a big problem	Ref. category			
Big problem	0.99	0.93	1.07	0.9353

Table 4: Age and place of residence adjusted association between first trimester antenatal care visit and miscarriage

Variable	Adjusted Relative risk	95%CI Lower	Upper	P-value
First trimester ANC visits for pregnant women (≤12 weeks)				0.0246[a]
No	Ref. category			
Yes	0.57	0.35	0.93	0.0246
Age categories, years				<.0001[a]
15 – 22	Ref. category			
23 – 29	1.09	1.03	1.16	0.0052
30- 39	1.18	1.08	1.28	0.0002
≥40	1.01	0.90	1.13	0.8798
Area of residence				<.0001[a]
Rural	Ref. category			
Urban	1.09	1.04	1.15	0.0010

Women aged 23–39 years had 1.1–1.2 times greater risk of miscarriages compared to women aged 15–22 years, however, the risk is not statistically different in women aged 40 years and more. Women in urban Ghana had 1.1 higher risk of miscarriage compared to their rural counterparts.

Women with formal education had an increased risk of miscarriage. Distance to the health facilities was associated with a decreased risk of miscarriage. The other remaining variables for which data was available examined showed no significant association.

Table 4 summarizes results from the study's adjusted model which considered significant variables from the bivariate analysis. The results revealed that the risk of the miscarriage in women who had first-trimester antenatal care visits was reduced by 43% compared to those who did not. Increasing age continues to be a significant risk factor for miscarriage up to age 40. Also, the slightly higher risk of miscarriage remains for urban women in Ghana.

Discussion

This study based on data from Ghana's maternal health survey shows that the vast majority of pregnant women do assess antenatal care and that pregnant women who accessed antenatal care services within the first trimester of pregnancy had a risk of miscarriage 43% lower compared to those who did not. Women who reside in rural Ghana had a lower risk of miscarriage than their urban counterparts. Among pregnant women who attended antenatal care within the first trimester of pregnancy, 19.1% reported having experienced miscarriage. A similar miscarriage rate has been reported in Kenya[27].

Most pregnant women view a long distance to a health facility as a daunting task owing to its ability to affect the frequency and timing of accessing antenatal care services which may lead to negative pregnancy outcomes[40,41]. Magadi et al noted that early and frequent antenatal care visit allows for an early identification and management of pregnancy complications[42]. The significance of the timing of antenatal care has also been observed in the present study, as the risk of miscarriage decreased with having an antenatal care visit in the first trimester. No doubt this reduction in the risk of miscarriage could in part be attributed to the successful roll out of the community-based health planning and services (CHPS) system with most community health workers now being deployed to remote and hard to reach areas to deliver health services[43]. The early initiation of antenatal care, detection and referring of pregnancy complications is important to successfully remedy high miscarriage rates.

Besides first trimester antenatal visit, advancing maternal age also contributed to the occurrence of miscarriage[44]. Cohain et al. found that miscarriage consistently increased between age 20-39 years but decreased after age 40 years[45]. This pattern may be explained by the smaller proportion of women actively engaged in childbearing after age 40 and the closer attention and monitoring of pregnancies in older women. Also, pregnancy rates reduce after an advanced age due to menopause that limits women's ability to get pregnant.

Consistent with an earlier finding, our study found that urban women were at greater risk of miscarriage compared to rural residents[27]. A possible explanation for this finding is that women in some rural settings in sub-Saharan Africa and specifically Ghana may be reluctant to disclose their pregnancy status or miscarriage history due to cultural and superstitious beliefs about pregnancy disclosure. This has been recognized as one of the reasons for delays in seeking ANC services[26,46]. The underreporting of miscarriages among rural women is a possibility in this study. In addition, other genetic-related factors including chromosomal abnormalities have been proposed as being associated with spontaneous miscarriages[47], however, we have no data on these factors in the present study.

Strengths and Limitations

A major strength of this study is the first of its kind to have explored the impact of first- trimester antenatal care visits on the risk of miscarriage among women of reproductive age in Ghana. This study also uses robust statistical methods. Our study has a few limitations that should be noted. Our study captured a little over 31% of pregnant women accessing ANC services in the first trimester. There is the likelihood that some cases of miscarriage would have been missed due to late or no ANC visit. Pregnancy and miscarriages may be under-reported for cultural reasons in rural areas. The relatively low numbers of first trimester ANC visits may generate moderately imprecise estimates.

There is also the risk that induced abortions were misclassified as miscarriage. With Ghana's strict laws on induced abortion and the stigma associated with it, underreporting is common. In Ghana, induced abortion is only permitted if, the fetus or health of the mother is in danger or there is a need for emergency treatment as recommended by a trained health professional. Lastly, since our data is based on self-report, it is open to recall bias.

Conclusion

This cross-sectional study explored the influence of the first trimester ANC visit on miscarriage risk on the national level in Ghana. It is the first of such study. It highlights the important role of early ANC visits on miscarriage risk reduction in a resource-constrained setting. This information is valuable to both researchers and policymakers for future research, public health intervention planning, and resource allocation. It also offers clinicians the opportunity to appreciate where health care delivery can and has made an impact on the health of a population.

Acknowledgments

The authors are grateful to the Demographic Health Survey for granting them access to their dataset for analysis.

Ethical Approval

Ethical approval was not required for this study since it was a secondary analysis of a national maternal health survey already conducted by the Demographic Health Survey (DHS). The research and analysis reported on in this paper are based on that survey's Public Use Micro Data Files (PUMF) that are accessible on request. The views expressed in this paper do not represent the views of the demographic health survey.

Funding

None.

Conflict of Interest

The authors have no competing interests to report.

Contributions of Authors

The authors BC, SKE, and CD conceived and designed the study. BC and SKE conducted the analysis and interpretation of secondary data collected by Demographic and Health Survey. BC and SKE prepared the draft manuscript. CD edited the draft manuscript and added significant technical and intellectual content. All authors have read and approved the manuscript.

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