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ANTENATAL CARE VISITS AND PREGNANCY OUTCOMES AT A KENYAN RURAL DISTRICT HOSPITAL: A RETROSPECTIVE COHORT STUDY

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ABSTRACT

Background: The goal of antenatal care (ANC) is to improve maternal and neonatal outcomes. Fewer ANC visits in focused antenatal care (FANC) model can affect maternal and perinatal outcomes in low income settings where the number ANC visits are often low.

Objective: To determine the number of ANC visits and their influence on maternal and perinatal outcomes at a rural Kenyan hospital.

Study design: Retrospective cohort.

Study population: Women who received ANC and were admitted at Longisa District Hospital postnatal ward after delivery at or above 28 weeks gestation.

Study site: Postnatal ward, Longisa District Hospital, Bomet County, Kenya.

Results: Between 1st July and 31st August 2014, 200 (83%) of the screened postpartum (n=241) women were found to be eligible. Majority (n=122, 61.0%) of the women received less than 4 ANC visits. Most women were: married (83.5%), housewives (65.5%), and had: parity of 2 to 4 (50.5%); primary education (66.5%); live births (93.0%); spontaneous vertex delivery (82.5%); spontaneous onset of labour (n=192, 96.0%) and no complication at or post-partum (n=175, 87.5%). Majority of the neonates had 5 minute APGAR score >7 (88.0%); and were with their mothers after 24 hours postpartum (81.5%). High parity (≥5) was associated with reduced frequency of ANC visits (OR=0.29, 95% CI 0.1-0.87, p=0.027). Early perinatal and maternal outcomes were not significantly associated with the number of ANC visits.

Conclusion: In this rural Kenyan hospital, few women had 4 or more ANC visits. Parity of 5 or greater was significantly associated with fewer than 4 ANC visits. Early perinatal and maternal outcomes did not vary with the number of visits. Quality rather than number of ANC visits should be evaluated as a measure of ANC.

INTRODUCTION

Antenatal care (ANC) is an entry point for a pregnant woman to receive a wide range of health promotion and preventive services such as nutritional support, and prevention and treatment of anaemia. ANC also helps pregnant women to develop birth plan, birth preparedness and complication readiness. The World Health Organization (WHO) recommends four antenatal care visits for women whose pregnancies are progressing normally in focused antenatal care (FANC) model, and when complications are detected, the frequency and scope of visits is increased.(1)

Despite the known benefits of ANC, in resource limited settings, ANC visits are often less than four. A retrospective study on gestation age at antenatal booking and delivery outcomes in Nigeria, found high (86%) prevalence of late booking and fewer number of ANC visits.(2) Similar prevalence was reported in the Kenya Demographic Health Survey (KDHS), 2008/2009. In The KDHS, although the ANC coverage was high (92%), 53% reported less than 4 ANC visits and most occurred in the second (43%) or third (42%) trimester. (3) Socio-demographic factors including marital status, maternal age, first pregnancy and parity, wealth quintile, distance from a health facility, level of education are commonly cited as factors influencing ANC use and number of visits. (4,8-14) In a multicentre prospective observational study in high resource country on determinants of the number of antenatal visits in Brussels, reported

that women with higher education, income and social status, with health insurance and low parity attained a higher number of ANC visits.(5) In comparison to low and medium income countries (LMIC), a 2002 Centre for Disease Control (CDC) population based cross-sectional study conducted in rural Western Kenya, Gem and Asembo found that mothers who had less than three ANC visits were single, aged above thirty four or below eighteen years, had a parity of at least five, less than eight years of formal education and were of low socio-economic status. Significantly, the ANC attendance by primigravida was higher in this study. (6)

To be an effective measure of ANC, the number and frequency of ANC visits should be balanced against maternal and perinatal outcomes. Studies on pregnancy outcomes in patients with fewer visits (less than four ANC visits) have reported varying findings with some noting an increase in unfavourable outcomes (operative deliveries, obstetric haemorrhage, pre-eclampsia, eclampsia, low birth weight, poor APGAR scores and high maternal and perinatal mortality). (2,5,15-19) The 2001 WHO systematic review of randomized controlled trials for routine antenatal care, by Carroli et al, reported that most clinical outcomes such as pre-eclampsia, urinary tract infection, severe postpartum anaemia, maternal mortality and low birth weight were comparable between the traditional ANC and goal-oriented reduced-visit (FANC) groups. However, compared with the women who received traditional ANC, women in low and middle-income countries who went through reduced-visits experienced a 15% higher risk of perinatal mortality. In contrast, perinatal mortality was comparable in high-income countries.(7) A prospective cohort study on ANC and perinatal outcomes in Kwale District of Kenya, (2004/5) found that women who visited ANC more than once were more likely to have live birth versus stillbirth.(4)

It is unknown whether the distribution of ANC visits seen nationally in the 2009 KDHS holds especially in rural settings in Kenya and whether the number of visits influences pregnancy outcomes. We sought to determine the proportion of women who received the minimum recommended number of ANC visits and the influence the number of ANC visits has on maternal and perinatal outcomes among postpartum women who received ANC and delivered at Longisa, a rural District Hospital, in Kenya.

MATERIALS AND METHODS

Study population, setting and sample size

This was a retrospective cohort study that was carried out over a period of 2 months, from July through August 2014 at the postnatal ward of Longisa District Hospital, Bomet County, Kenya. Longisa District Hospital is a referral centre for five health centres and twenty-four dispensaries. It provides antenatal, intrapartum and postnatal care for women booked through the ANC, or referred from other peripheral facilities. The hospital also refers patients to Tenwek Mission Hospital which has better facilities such as Intensive Care Unit. Study participants were postpartum women admitted in Longisa District Hospital's postnatal ward immediately after delivery at or above 28 weeks gestation and had at least one ANC clinic visit. The sample size was calculated to be 142 mothers.

Variables

The exposure was the number of antenatal care visits. Pregnancy outcomes were broadly categorized into maternal and perinatal. Maternal outcomes were gestation age at delivery, mode of onset of labour and delivery, complications at and post-delivery, and maternal mortality. Early perinatal outcomes were birth weight, APGAR score, admission to new born unit, neonatal status 24 hours after birth, and foetal death. We also collected data on factors likely to be associated with ANC visits and pregnancy outcomes such as socio-demographic and obstetric factors.

Data collection and statistical analysis

Data was collected from the ANC card, referral letters, hospital records (admission and progress notes, referral or death, labour and delivery or theatre records). Data analysis was carried out using the Statistical Package for Social Sciences version 17.0 (SPSS Inc, Chicago, IL, USA). Chi-square for categorical variables and Student's t-test for continuous variables was used to test for association between socio-demographic and obstetric characteristics and the number of ANC visits. Proportions of relevant perinatal indicators were determined and compared between those who had less than 4 and those who had 4 or more ANC visits using Chi-square tests. Binary logistic regression was carried out to assess the relationship between the maternal and perinatal outcomes and the number of ANC visits. The

strength of associations was determined through calculating odds-ratio (OR) with 95% confidence interval (CI). Associations were considered to be significant at p-value < 0.05.

Ethical approval

Approval was obtained from the Kenyatta National Hospital/ University of Nairobi Ethics and Research Committee, the Department of Obstetrics and Gynaecology, and the Longisa District Hospital Health committee. All participants provided informed consent after they were informed of the nature and purpose of the study.

Results

Between 1st July, 2014 and 31st August, 2014, two hundred and forty-one mothers were admitted in the postnatal ward, of Longisa District Hospital, Bomet County of which 200(83.0%) were eligible (figure 1). One hundred and twenty-two (122, 61.0%) of the 200 participants had less than four ANC visits and only 78 (39.0%) had four or more ANC visits. Overall, majority, 167(83.5%) of the study participants were married, 101(50.5%) had parity of two to four, 133(66.5%) primary level of formal education, and 131(65.5%) were housewives (Table 1).

Sociodemographic characteristics were similar between those who had fewer than 4 versus 4 or more ANC visits except for parity, grand multiparity (5 or greater parity) which was significantly associated with lower frequency of the recommended number of ANC visits. Only five (6.4%) of mothers with parity greater than 5 had 4

or more ANC visits compared to 43.6% of primiparous mothers (OR=0.29, 95% CI 0.1-0.87, p = 0.027). Thus, grand multiparous postpartum mothers were 71% significantly less likely to attend ANC 4 or more times compared to primiparous women. Maternal education, occupation, and level of formal education were not significantly associated with number of ANC visits.

Majority (n=193, 96.5%) of the mothers had live births, and eighty eight percent (n=176, 88.0%) of the neonates had 5-minute APGAR scores above 7. Most neonates (n=185, 92.5%) weighed 2500 to 3999 grams; and (n=163, 81.5%) were with their mothers 24 hours post-delivery (Table 2). Perinatal outcomes i.e. stillbirth, APGAR scores, birth weight and state of babies after 24 hours were not significantly associated with number of ANC visits. Most participating mothers (n=165, 82.5%) had spontaneous vertex delivery; 192 (96.0%) had spontaneous onset of labour; 175 (87.5%) had no complication at delivery and 175 (87.5%) had no complication at 24 hours post-delivery (Table 3). Maternal outcomes did not show significant associations with number of ANC visits. Mothers who had 4 or more ANC visits had higher but non-significant frequency of postpartum haemorrhage compared to those who had fewer visits. Assisted vaginal delivery (OR = 1.61, 95% CI 0.1-26.3) or caesarean section (OR = 1.21, 95% CI 0.54-2.73) were not significantly associated with higher frequency of ANC visits. Similarly, onset of labour was not associated with number of ANC visits, (OR = 0.8, 95% CI 0.14-4.46, p =0.797).
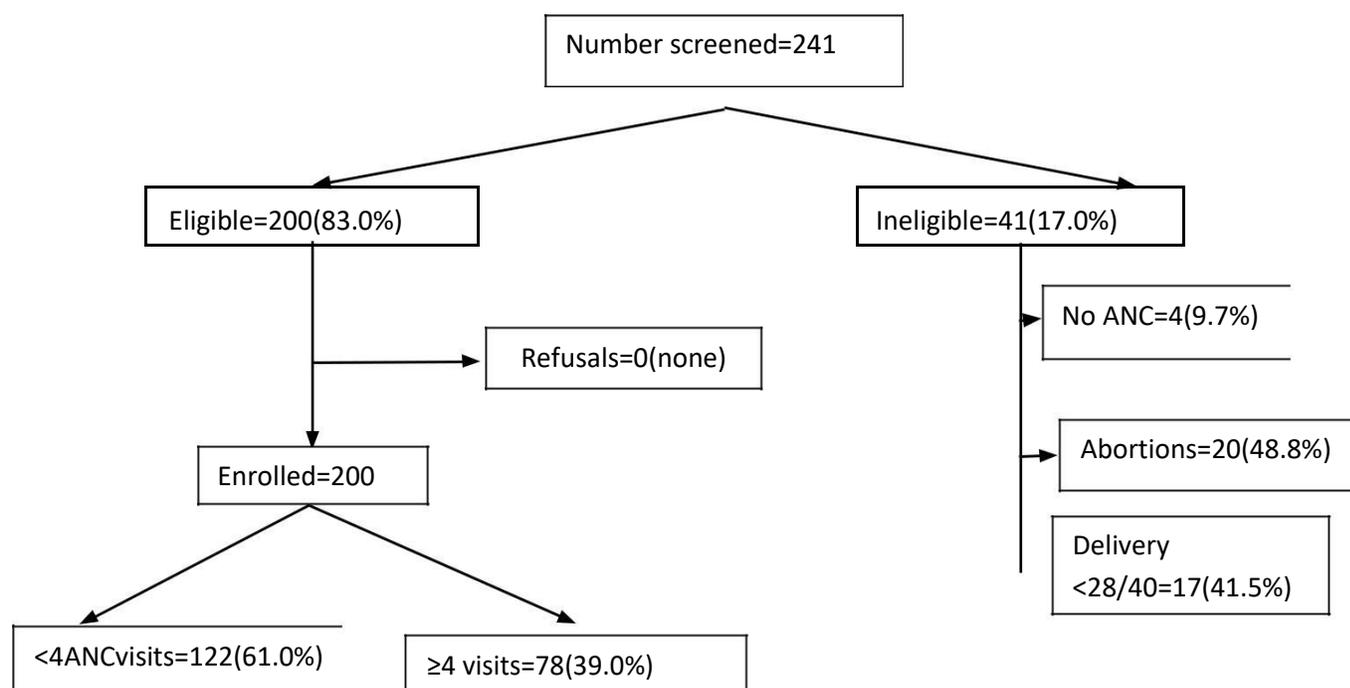
Table 1

Socio-demographic factors of study participants and the number of ANC visits

Socio-demographic characteristic	Number of ANC visits		OR(95% CI)	P-value
	≥4visits n=78(%)	<4 visits n=122(%)		
Marital status				
Single	9(11.5)	23(18.9)	1.00	
Married	68(87.2)	99(81.1)	1.76(0.77-4.03)	0.184
Divorced/ separated	1(1.3)	0(0.0)	NA	NA
Parity				
Para 1	34(43.6)	40(32.8)	1.0	
Para 2 -4	39(50.0)	62(50.8)	0.74(0.4-1.36)	0.332
Para 5 or above	5(6.4)	20(16.4)	0.29(0.1-0.87)	0.027
Level of education				
None	3(3.8)	3(2.5)	1.0	
Primary	53(67.9)	80(65.6)	0.66(0.13-3.41)	0.622
Secondary	19(24.4)	32(26.2)	0.59(0.11-3.24)	0.547
College/ University	3(3.8)	7(5.7)	0.43(0.05-3.48)	0.428
Occupation				
Student	9(11.5)	16(13.1)	1.0	
Housewife	49(62.8)	82(67.2)	1.06(0.44-2.59)	0.894
Civil servant	3(3.8)	5(4.1)	1.07(0.21-5.54)	0.939
NGO/ private firm employee	0(0.0)	1(0.8)	NA	NA
Business	17(21.8)	18(14.8)	1.68(0.59-4.81)	0.334

Table 2

Perinatal outcomes and the number of ANC visits

Perinatal outcome	Number of ANC visits		OR (95% CI)	P- value
	≥4visits, n=78(%)	<4visits, n=122(%)		
State at birth				
Live birth	71(91.0)	115(94.5)	1.0	
Still birth	4(5.1)	3(2.5)	1.2(0.26-5.54)	0.811
Live with malformation	3(3.8)	4(3.3)	1.0	
APGAR score at 5 minutes				
3 or less	3(3.8)	2(1.6)	1.0	
4 to 7	7(9.0)	12(9.8)	0.39(0.05-2.92)	0.359
Above 7	68(87.2)	108(88.5)	0.41(0.07-2.54)	0.34
Birth weight (grams)				
4000 or over	2(2.6)	2(1.6)	1.0	
2500-3999	72(92.3)	113(92.6)	1.27(0.11-14.31)	0.844
1500-2499	4(5.1)	5(4.1)	1.6(0.1-24.7)	0.736
1000-1499	0(0.0)	1(0.8)	NA	NA
Below 1000	0(0.0)	1(0.8)	NA	NA
State after 24 hours				
With mother	65(83.3)	98(80.3)	1.0	
Admitted in NBU	7(9.0)	7(5.7)	0.68(0.17-2.7)	0.58
Foetal death	2(2.6)	3(2.5)	1.05(0.17-6.45)	0.957

Table 3
Maternal outcomes and the number of ANC visits

Maternal outcome	Number of ANC visits		OR(95% CI)	P –value
	≥4visits n=78(%)	<4 visits n=122(%)		
Mode of delivery				
Spontaneous vertex delivery	63(80.8)	102(83.6)	1.0	
Assisted vaginal delivery	2(2.6)	2(1.6)	1.61(0.1-26.26)	0.737
Caesarean section	13(16.7)	18(14.8)	1.21(0.54-2.73)	0.646
Mode of labor onset				
Spontaneous	74(94.9)	118(96.7)	1.0	
Induced	4(5.1)	4(3.3)	0.8(0.14-4.46)	0.797
Complications at delivery				
None	67(85.9)	108(88.5)	1.27(0.49-3.2)	0.584
PPH	7(9.0)	4(3.3)	2.9(0.71-14)	0.084
Retained placenta	0(0.0)	3(2.5)	NA	NA
Perineal/ cervical tear	1(1.3)	5(4.1)	0.3(0.01-2.8)	0.255
Others	3(3.8)	2(1.6)		
Complications within 24 hrs of delivery				
None	69(88.5)	106(89.9)	1.0	
PPH	2(2.6)	2(2.5)	0.57(0.1-2.47)	0.412
Anaemia	1(1.3)	0(0.0)	NA	NA
Fever	0(0.0)	3(2.5)	1.0	
Eclampsia	2(2.6)	0(0.0)	NA	NA
Death	2(2.6)	1(1.6)	1.0	

DISCUSSION

In this retrospective study conducted in a rural District Hospital, we found that fewer than four ANC visits was not associated with any adverse maternal or perinatal outcomes compared to four or more visits. The World Health Organization (WHO) recommends four antenatal care (ANC) visits for uncomplicated pregnancies in the focused antenatal care (FANC) model. In this study, we found that fewer women (39%) had at least the WHO recommended four ANC visits, a number lower than the national estimate of 47% for all women and 44% in rural areas of Kenya according to the Kenya Demographic Health Survey (KDHS) 2008/2009. (3) This may be due to fee charged for ANC services at this time thus keeping women with low or no income levels away.

We found no significant association between the marital status, education level, economic status and the number of ANC visits. Majority of people in this county are peasant farmers and small-scale traders whose level of income may not have varied markedly. We noted that the proportion of women who were married, housewives or with primary level of formal education was similar in the two groups (less than 4 or 4 and greater ANC visits) may be as a result of women in this setting often start child bearing early and subsequently do not continue with education. On the contrary, in his retrospective cross-sectional study on the effect of mother's education on ANC in Bangladesh, 2012, Ruhul found that <10% of illiterate mothers compared to >40% of mothers who had completed secondary education or higher, attended at least four ANC visits.(12) Similarly, Beeckman et al. in their multicentre prospective observational study on determinants of the number of antenatal visits in Brussels, reported that women with higher education, income and social status; with health insurance, attained a higher number of ANC visits.(5) The KDHS, also reported that the proportion of women who get ANC increases as the education level of women increase.(3)

In his study on the pregnancy outcomes on booked and unbooked mothers at Kenyatta National Hospital (KNH) in 1999, Wanyoro also reported that the socioeconomic status affected the number of ANC visits. (14) The different finding in our study setting would be explained by the

relative uniformity in socio-economic status compared to KNH.

Fewer number of ANC visits was significantly associated with the parity as grand multiparous mothers were less likely to have 4 or more ANC visits. Such mothers may feel more experienced to deal with their pregnancies compared to first time mothers. This finding compares with findings of a Tanzania survey on factors associated with four or more ANC visits and its decline among pregnant women between 1999 and 2010. In this Tanzanian survey, Gupta et al., noted that women with a higher parity besides other factors, had less odds of attending ANC at least four times. (13)

Similarly, a Centre for Disease Control (CDC) population based cross-sectional study done in rural Western Kenya, Gem and Asembo by van Eijk et al., in 2002 on the use of antenatal services and delivery, it was pointed out that mothers who had fewer ANC visits, among other factors, had a parity of at least five. (6) Kenya demographic health survey (KDHS) carried out by the Kenya National Bureau of Statistics (KNBS), 2008/2009 also found a relationship between parity and the number of ANC visits.(3) The survey reported that women with a higher parity were less likely to attend at least four ANC visits. This finding provides opportunity for intervention among women with higher parity who may be at increased risk of adverse maternal outcomes such as postpartum haemorrhage, uterine rupture, and in the event of death may leave behind vulnerable orphans. This is supported by a review of data from 10 high fertility countries in which Emily Sonneveldt et al demonstrated that high order births was associated with lower health care services and increased maternal and perinatal mortality.(20)

Our study did not find any association between the perinatal outcomes (state of neonate at birth, 5 minute APGAR score, birth weight, state of neonate at 24 hours postpartum and foetal death) and the number of visits. However, mothers with <4 ANC visits reported higher frequency of infants with 5 minute APGAR score less than 7, although this may have been due to the higher prevalence of low birth weight infants in this category. This is concerning because a WHO systematic review of randomized controlled trials for routine antenatal care, by Carroli et al, Lancet, found that, women in low and middle-income countries who received goal-oriented antenatal care through the reduced-visits approach experienced a 15% higher risk of perinatal mortality. Earlier, in his cross-sectional study to compare outcome of labour between booked and unbooked parturients in KNH, 1999, Wanyoro found that patients with fewer ANC visits had higher rates of foetal death, new born unit admissions; perinatal mortality. (17) Similar findings were reported by a cohort survey on antenatal care and perinatal outcomes in Kwale District of Kenya.(4) Such and these findings may inform larger studies powered to measure low APGAR scores and low birth weights and the number of ANC visits.

In this study, there was no significant association between maternal outcomes (mode of labour onset, delivery, complications at and postpartum) and the category of ANC visits. This finding may be explained by the fact that those at risk of adverse pregnancy outcome may have been referred during ANC or labour either by clinicians or self-referred themselves to the nearby Tenwek Mission Hospital. We found that mothers who had 4 or more ANC visits had higher but non-significant frequency of postpartum haemorrhage compared to those who had fewer visits. The increased visits may have resulted from a higher frequency of predisposing factors from current or previous pregnancies. Other studies on pregnancy outcomes in patients with fewer visits (less than four ANC visits) have reported varying outcomes with some finding an increase in unfavourable outcomes (operative deliveries, obstetric haemorrhage, pre-eclampsia, eclampsia, high maternal morbidity and mortality). (5, 6, 15-19) The WHO multicentre randomized controlled trial (conducted in clinics in Argentina, Cuba, Saudi Arabia and Thailand) comparing traditional model to the reduced-visit-model of ANC and the systematic review of randomized controlled trials of routine ANC in 2001, Villar et al. found no difference in the rates of postpartum anaemia, urinary tract infection, maternal mortality. However, those in the reduced-visit model reported slightly higher rates of pre-eclampsia eclampsia. (19) In his cross-sectional study to compare outcome of labour between booked and unbooked parturients in Kenyatta National Hospital in Kenya, 1999, Wanyoro concluded that patients with fewer ANC visits or unbooked are a high risk-group for maternal mortality.(14) Our study had the following strengths; there was complete follow-up and assessment of outcomes was done upon recruitment. This eliminated any bias from loss to

follow-up which may arise when participants are followed for longer period of time.

However, our study also had some limitations which nevertheless do not significantly affect our findings. For example, patients who were referred prior to delivery could have been missed out. However, since our study was focused on FANC model, this finding did not affect our interpretation. Also, the number of participants was small for secondary analysis of some outcomes but large enough for our primary outcomes.

CONCLUSION

In this rural District Hospital in Kenya, few women made 4 or more ANC visits. Women with high parity were less likely to make at least four ANC visits. Maternal and early perinatal outcomes did not vary significantly between those who visited the ANC 4 or more times and those who made fewer visits.

RECOMMENDATIONS

Larger prospective studies are required to evaluate the quality of care provided by more or fewer ANC visits in resource limited settings. Women with high parity should be targeted to increase ANC attendance.

REFERENCES

1. Villar, J. and Bergsjo, P.2003. WHO Antenatal Care Randomised Trial: Manual for the Implementation of the New Model. WHO/RHR/01.30.WHO: Geneva.
2. Okunlola, M.A., Owonikoko, K.M., Fawole, A.O., et al. 2008. Gestational age at antenatal booking and delivery outcome. Afr. J. Med. Med. Sci., 37(2):165-9.
3. Kenya National Bureau of Statistics: Kenya Demographic and Health Survey. 2008/2009. Maternal and child health.
4. Brown, C.A., Sohani, S. B., Khan, K., Lilford, R. and Mukwana, W.-2004/5- Cohort Survey of Antenatal care and Perinatal Outcomes in Kwale, Kenya.
5. Beeckman, K., Louckx, F. and Putman, K. 2010. Determinants of the number of antenatal visits in a metropolitan region. BMC Public Health, 10:527
6. van Eijk, A.M., Bles, H.M., Odhiambo, F., Ayisi, J. G. et al., Use of Antenatal Services and Delivery in Rural Western Kenya, A Community Based Study, 2002. Reproductive Health 2006; 3:2.
7. Carroli, G., Villar, J., Piaggio, G., Khan-Neelofur, D., Gülmezoglu, M., Mugford, M., Lumbiganon, P., Farnot, U. and Bersgjø, P. WHO Systematic Review of Randomised Controlled Trials of Routine Antenatal Care. Lancet. 2001 May 19;357(9268):1565-70.

8. Lompo, K., Hutin, Y.J., Traore, G., Tall, F., Guiard-Schmid, J.B., Yameogo, G. and Fabre-teste, B. Morbidity and Mortality Related to Obstetrical Referral Patients to the Hospital of Bobo-Dioulasso. Burkina Faso. Annales de la Societe Belge de Medecine Tropicale. 1993; 73(2):153-63. [PubMed: 8368892]
9. Garenne, M., Mbaye, K., Bah, M. D. and Correa, P. Risk Factors for Maternal Mortality: A Case-control Study in Dakar Hospitals (Senegal). African Journal of Reproductive Health. 1997; 1(1):14-24. (PubMed: 10214399)
10. van de Broek, N.R., White, S.A., Ntonya, C., Ngwale, M., Cullinan, T.R., Mollyneux, M.E., Neilson, J.P. Reproductive health in rural Malawi: A population based survey. BJOG. 2003 Oct.; 110(10): 902.8.
11. Bell, Jacquelline, S, Ouedraogo, Moctar, Ganaba, Rasmane, Sombie, Issiaka, Byasi, Peter, Baggaley, Rebecca F, Fillipi, Veronique, Fitzmaurice, Ann E, Grahan, Wendy J. Epidemiology of pregnancy outcomes in rural Burkina Faso; Tropical Medicine and International Health, vol. B, suppl.1 July,2008, pp 31-43(13).
12. MD Ruhul Kabir, 2012. Does mother's education affect antenatal care visits in Bangladesh? MMED Thesis; Umea University, Sweden.
13. Gupta, S., Yamada, G., Mpembeni, R., Frumence, G., Callaghan-Koru, J.A., et al. (2014) Factors Associated with Four or More Antenatal Care Visits and Its Decline among Pregnant Women in Tanzania between 1999 and 2010. PLoS ONE 9(7): e101893. doi:10.1371/journal.pone.0101893
14. Wanyoro, A.K. 1999. To compare outcome of labour between booked and unbooked parturients in Kenyatta National Hospital; M. Med. Dissertation, University of Nairobi, Kenya.
15. Owolabi, A. T., Fatusi, A. O., Kuti, O., Adeyemi, A., Faturoti ,S.O, Obiajuwa, P. O., Maternal complications and perinatal outcomes in booked and unbooked Nigerian mothers. Singapore. Med. J. 2008; 49(7):526-531.
16. Habibov, N.N. 2010. The socio-economic determinants of antenatal care utilization in Azerbaijan: evidence and policy implications for reforms. Health Econ Policy Law, 2:1-29.
17. Ndiweni, Q. and Buchmann, E.J. 1998. Unbooked mothers and their babies –what causes the poor outcomes? S Afr Med J, 88(2): 192-199
18. Chigbu, B. Onwere, S., Kamanu, C.L., Aluka, C., Okoro, O. and Adebe, E., Pregnancy Outcomes in Booked and Unbooked Mothers in South Eastern Nigeria. East Afr Med J.2009 Jun; 86(6):267-71.
19. Villar, J., Ba'aqeel, H., Piaggio, G., Lumbiganon, P., Miguel Belizan, J., et al. (2001) WHO antenatal care randomized trial for the evaluation of a new model of routine antenatal care. Lancet 357: 1551–1564
20. Sonneveldt, E., DeCormier Plosky, W., Stower, J. et al. Linking High Parity and Maternal and Child Mortality: What is the Impact of Lower Health Service Coverage among Higher Order Births? BMC Public Health 2013, 13(Suppl 3) S7