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Original Article

Determinants and obstetric outcomes of high prenatal care utilization in a developing country

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Abstract

Background: High prenatal care utilization could put a strain on the resources within the health system, especially in a developing economy. However, the factors responsible have not been explored in the Nigerian context.

Methods: Using a prospective design, records of observed visits of antenatal attendees were employed to calculate the Kotelchuck Index, and identify determinants of high prenatal care utilization.

Results: Most of the women, 514 (43.5%), had adequate prenatal visits, while 53 (4.5%) had excessive utilization. Excessive prenatal care utilization was predicted by being employed (81.1% versus 18.9%, $p=0.024$). Also, when compared with adequate users, women who utilized prenatal services excessively were significantly more likely to be aged between 20 years and 39 years (98.1% versus 97.5%, $p=0.041$), with pre-eclampsia (11.3% versus 2.1%, $p<0.0001$), and previous cesarean birth (18.9% versus 11.9%, $p=0.047$). Regarding their deliveries, excessive utilizers were significantly more likely to have cesarean births (30.2% versus 28.2%, $p=0.008$), and deliver before term (64.2% versus 13%, $p<0.0001$), compared with adequate utilizers. Mothers with pre-eclampsia (odds ratio: 4.84; 95% CI 1.92-12.23, $p=0.001$), and delivery before term (odds ratio: 0.09; 95% CI 0.05-0.17, $p<0.0001$) were found to be independently associated with excessive prenatal care utilization.

Conclusions: Availability of emergency obstetric service and improved facilities for neonatal intensive care are advocated to promote safe motherhood.

Keywords: emergencies, Nigeria, pregnancy outcome, prenatal care

Introduction

Assessment of prenatal care utilization is an indicator of the performance of public health care systems. The adequacy, or otherwise, of prenatal service utilization is a vital criterion in the evaluation of safe motherhood and new-born programs, which in turn depends on the method by which the utilization is assessed [1-3]. The indices for evaluating prenatal service utilization have provided a template for research, resource allocation, and formulation of public health programs designed to increase the efficiency of antenatal care and improve

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perinatal outcomes. This becomes more relevant when considered in the light of the evidence that under- and over-utilization of prenatal services have been linked with adverse pregnancy outcomes and increased medical costs [4-7].

In developing countries with limited, or absent, public funding of health care and inadequate staffing, excessive prenatal service utilization can compound these problems, and lead to a collapse of the health system. With a high patient-load on a thinned-out staff strength, burn-outs, fatigue, decline in quality of patient care, and even high turnover of medical personnel will occur [8]. Also, when pregnant women utilize antenatal services excessively, unnecessary request and provision of diagnostic and therapeutic services may occur. This could also scale up the need for specialized personnel in areas such as labor rooms and emergency department, with an overall increase in the cost of health care [9]. Rising costs of health care may lead to a neglect of the health facilities by pregnant women, with a concomitant increase in the patronage of quacks and traditional birth attendants.

Although there are data in the global literature on factors that predict adequate utilization of prenatal facilities, this subject has not been explored in the Nigerian context. What characteristics determine the excessive use of prenatal services in Nigeria? Do they differ from what obtains in developed nations? This paper explores the determinants of high utilization of prenatal services in a developing nation, and the obstetric and perinatal outcomes, with a view to making recommendations that will guide public health intervention programs.

Methods

This prospective study was conducted in the Department of Obstetrics and Gynecology of Ekiti State University Teaching Hospital, Ado – Ekiti, the capital city of Ekiti State in southern Nigeria, between July 2013 and June 2015. Ado – Ekiti is a semi-urban city with a human population of 308,621, made up of mainly low- and middle-income earners who are mostly Yoruba-speaking Christians [10]. The hospital is the only state-owned tertiary health institution in Ekiti State and receives patients from various private, primary, and secondary health facilities within the state, and from neighboring Ondo, Kogi, and Osun states. Eligible participants were healthy pregnant women who registered for antenatal care and delivered in the hospital. Pregnant women who were cared for in the hospital during the study period, but were not booked for prenatal care, had a severe medical illness, or had incomplete obstetric records were excluded from the study. This study was conducted in accordance with the Declaration of Helsinki and informed consent was duly obtained. The study was approved by the Ethics and Research Committee of the Ekiti State University Teaching Hospital, Ado – Ekiti.

A proforma was used for data collection from the clients' case records, and entries from the materno-fetal medicine/antenatal ward, obstetric emergency room, labor room, and maternity theatre. These were entered into a comprehensive obstetric and perinatal database by a trained research assistant employed on a full-time basis. Information extracted from the entries included age, marital status, parity, level of education, health insurance coverage and employment status; previous history of miscarriages, stillbirths, and cesarean births; HIV status, incidence of pre-eclampsia, or reduced fetal movements; need for induction of labor, estimated gestational age at delivery, mode of delivery, APGAR score in the fifth minute, and admission into neonatal intensive care unit. The gestational age at delivery was obtained in weeks from the first day of the last menstrual period or extrapolated from an early pregnancy scan. The APGAR score was assessed by the attending pediatrician or midwife as appropriate. Prenatal service utilization was recorded as a number of separate visits to the department for routine prenatal care, unscheduled visits to the materno-fetal medicine/antenatal ward, obstetric emergency unit, and labor room visit that did not result in delivery. The recorded visits did not include routine scheduled ultrasound scans, but covered visits on account of pregnancy complications. The number of scheduled/expected visits between initiation of antenatal care and delivery was determined based on the guidelines from the American College of Obstetricians and Gynecologists [11]. The Kotelchuck Index (KI) was calculated by dividing the number of observed prenatal clinic visits by the number of expected visits and multiplying by 100 and was designated as inadequate (<50% of expected), intermediate (50–79%), adequate (80–109%), and adequate plus (110–139%). Following the modification by Magriples et al, another group (>140%) was included to represent excessive utilization of prenatal care [3,7].

The retrieved data was coded into and analyzed using the Statistical Software for the Social Sciences (SPSS) package version 20. Descriptive characteristics were presented as percentages. Pearson's Chi-square and Fisher's exact tests (where appropriate) were used for categorical variables; variables with p-value < 0.05 were included in logistic regression analyses to identify the independent risk factors for excessive prenatal utilization. The results were expressed as odds ratio at 95% confidence interval (CI), with a level of significance set at $p < 0.05$.

Results

The demographic and socio-biologic characteristics are shown in Table 1. Eight (0.7%) of the women studied were teenagers, with 29 (2.5%) being above 40 years of age. Most of the mothers were married, 1178 (99.7%), multiparous, 746 (63.1%), in paid employment, 962 (81.4%), but without health insurance coverage, 1154 (97.6%). Fifteen (1.3%) had no more than primary education, while 1012 (85.6%) were educated up to the tertiary level. A history of miscarriages, stillbirths, and cesarean deliveries was obtained in 140 (11.8%),

62 (5.2%), and 177 (15%) respectively. Pre-eclampsia occurred in the index pregnancy in 35 (3%) of the study population, while 33 (2.8%) were HIV positive.

Table 1. Demographic and socio-biologic characteristics of the study population, n = 1182

Characteristics	Categories	Frequency	Percentages
Age (years)	≤ 19	8	0.7
	20 - 39	1145	96.9
	≥ 40	29	2.5
Marital status	Single	4	0.3
	Married	1178	99.7
Employment status	Unemployed	220	18.6
	Employed	962	81.4
Level of education	No formal	1	0.1
	Primary	14	1.2
	Secondary	155	13.1
	Tertiary	1012	85.6
Parity	Nullipara	436	36.9
	Multipara	746	63.1
Health insurance	No	1154	97.6
	Yes	28	2.4
Previous miscarriages	No	1042	88.2
	Yes	140	11.8
Previous stillbirth	No	1120	94.8
	Yes	62	5.2
Pre-eclampsia	No	1147	97
	Yes	35	3
HIV seropositive	No	1149	97.2
	Yes	33	2.8
Previous cesarean	No	1005	85
	Yes	177	15

The groups of the study population based on the KI are displayed in Table 2. Most of the women, 514 (43.5%), had adequate prenatal visits; 57 (4.8%) were under-utilizers of prenatal services, while 53 (4.5%) had excessive utilization of hospital facilities during the prenatal period.

Table 2. Distribution of the study population according to the KI, n = 1182

Category	Parameter (%)	Frequency	Percentage
Under-utilizers / inadequate	< 50	57	4.8
Intermediate	50 - 79	358	30.3
Adequate	80 - 109	514	43.5
Adequate plus	110 - 139	200	16.9
Excessive utilizers	140 and above	53	4.5

From Table 3, excessive prenatal care utilization was predicted by being employed (81.1% versus 18.9%, $p=0.024$). Also, when compared with adequate users, women who utilized prenatal services excessively were significantly more likely to be aged between 20 years and 39 years (98.1% versus 97.5%, $p=0.041$), with pre-eclampsia (11.3% versus 2.1%, $p<0.0001$), and previous cesarean section (18.9% versus 11.9%, $p=0.047$), but less likely to have reduced fetal movement (100% versus 97.5%, $p=0.002$). Regarding their deliveries, excessive utilizers were significantly more likely to have cesarean births (30.2% versus 28.2%, $p=0.008$), and deliver before term (64.2%

versus 13%, $p < 0.0001$), compared with adequate utilizers. Other obstetric, perinatal and demographic variables studied had no significant relationship with the adequacy of prenatal care utilization.

Table 3. Relationship between the KI class and the demographic and socio-biologic characteristics

Characteristics	Inadequate	Intermediate	Adequate	Adequate plus	Excessive
	n (%)	n (%)	n (%)	n (%)	n (%)
Age (years)					
≤ 19	2 (3.5)	5 (1.4)	1 (0.2)	0 (0)	0 (0)
20 – 39	52 (91.2)	343 (95.8)	501 (97.5)	197 (98.5)	52 (98.1)
≥ 40	3 (5.3)	10 (2.8)	12 (2.3)	3 (1.5)	1 (1.9)
$\chi^2 = 16.13$; $p = 0.041^*$					
Marital status					
Single	1 (1.8)	3 (0.8)	0 (0)	0 (0)	0 (0)
Married	56 (98.2)	355 (99.2)	514 (100)	200 (0)	53 (0)
$\chi^2 = 8.64$; $p = 0.071$					
Employment status					
Unemployed	12 (21.1)	53 (14.8)	116 (22.6)	29 (14.5)	10 (18.9)
Employed	45 (78.9)	305 (85.2)	398 (77.4)	171 (85.5)	43 (81.1)
$\chi^2 = 11.20$; $p = 0.024^*$					
Level of education					
No formal	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)
Primary	0 (0)	4 (1.1)	8 (1.6)	2 (1)	0 (0)
Secondary	12 (21.1)	52 (14.5)	63 (12.3)	20 (10)	8 (15.1)
Tertiary	45 (78.9)	301 (84.1)	443 (86.2)	178 (89)	45 (84.9)
$\chi^2 = 10.17$; $p = 0.601$					
Parity					
Nullipara	15 (26.3)	125 (34.9)	207 (40.3)	72 (36)	17 (32.1)
Multipara	42 (73.7)	233 (65.1)	307 (59.7)	128 (64)	36 (67.9)
$\chi^2 = 6.46$; $p = 0.167$					
Health insurance					
No	56 (98.2)	352 (98.3)	503 (97.9)	190 (95)	53 (100)
Yes	1 (1.8)	6 (1.7)	11 (2.1)	10 (5)	0 (0)
$\chi^2 = 8.22$; $p = 0.084$					
Previous miscarriage					
No	53 (93)	318 (88.8)	457 (88.9)	168 (84)	46 (86.8)
Yes	4 (7)	40 (11.2)	57 (11.1)	32 (16)	7 (13.2)
$\chi^2 = 5.11$; $p = 0.276$					
Previous stillbirth					
No	56 (98.2)	352 (98.3)	513 (99.8)	198 (99)	53 (100)
Yes	1 (1.8)	6 (1.7)	1 (0.2)	2 (1)	0 (0)
$\chi^2 = 6.61$; $p = 0.158$					
Pre-eclampsia					
No	56 (98.2)	353 (98.6)	503 (97.9)	188 (94)	47 (88.7)
Yes	1 (1.8)	5 (1.4)	11 (2.1)	12 (6)	6 (11.3)
$\chi^2 = 23.86$; $p < 0.0001^*$					
HIV seropositive					
Negative	54 (94.7)	347 (96.9)	501 (97.5)	195 (97.5)	52 (98.1)
Positive	3 (5.3)	11 (3.1)	13 (2.5)	5 (2.5)	1 (1.9)

$\chi = 1.74; p = 0.783$					
Previous cesarean section					
No	49 (86)	301 (84.1)	453 (88.1)	159 (79.5)	43 (81.1)
Yes	8 (14)	57 (15.9)	61 (11.9)	41 (20.5)	10 (18.9)
$\chi = 9.62; p = 0.047^*$					
EGA at delivery (weeks)					
≤ 36	50 (8.8)	29 (8.1)	67 (13)	55 (27.5)	34 (64.2)
37 – 41	50 (87.8)	301 (84.1)	432 (84)	144 (72)	19 (35.8)
≥ 42	2 (3.5)	28 (7.8)	15 (3)	1 (0.5)	0 (0)
$\chi = 151.64; p < 0.0001^*$					
Mode of delivery					
Vaginal	35 (61.4)	238 (66.5)	369 (71.8)	116 (58)	37 (69.8)
Abdominal	22 (38.6)	120 (33.5)	145 (28.2)	84 (42)	16 (30.2)
$\chi = 13.72; p = 0.008^*$					
Induction of labor					
No	54 (94.7)	320 (89.4)	443 (86.2)	171 (85.5)	42 (79.2)
Yes	3 (5.3)	38 (10.6)	71 (13.8)	29 (14.5)	11 (20.8)
$\chi = 8.40; p = 0.078$					
Reduced fetal movements					
No	57 (100)	349 (97.5)	501 (97.5)	185 (92.5)	53 (100)
Yes	0 (0)	9 (2.5)	13 (2.5)	15 (7.5)	0 (0)
$\chi = 17.21; p = 0.002^*$					
5-minute APGAR score					
< 7	2 (3.5)	21 (5.9)	15 (2.9)	8 (4)	1 (1.9)
≥ 7	55 (96.5)	337 (94.1)	499 (97.1)	192 (96)	52 (98.1)
$\chi = 5.49; p = 0.240$					
Neonatal intensive care admission					
No	52 (91.2)	320 (89.4)	474 (92.2)	188 (94)	51 (96.2)
Yes	5 (8.8)	38 (10.6)	40 (7.8)	12 (6)	2 (3.8)
$\chi = 5.58; p = 0.233$					

Results of the logistic regression analysis of the variables significantly associated with excessive prenatal care utilization are shown in Table 4. Mothers with pre-eclampsia (odds ratio: 4.84; 95% CI 1.92 - 12.23, $p=0.001$) and delivery before term (odds ratio: 0.09; 95% CI 0.05 - 0.17, $p<0.0001$) were found to be independently associated with excessive utilization of hospital services during pregnancy.

Table 4. Logistic regression analysis of risk factors associated with excessive utilization of prenatal services

Risk factors	Odds ratio	95% CI	p-value	Reference
Pre-eclampsia	4.84	1.92 - 12.23	0.001*	Normotensive
RFM	0.00	0.00 - ∞	0.998	No RFM
Age (20 - 39)	1.04	0.22 - 4.89	0.963	Teenagers (≤ 19)
Employed	0.98	0.49 - 1.99	0.961	Unemployed
Preterm delivery	0.09	0.05 - 0.17	$<0.0001^*$	Term
Cesarean birth	0.88	0.49 - 1.61	0.686	Vaginal birth
Previous CS	1.34	0.66 - 2.72	0.418	No previous CS

*significant at $p<0.05$.

RFM: Reduced fetal movement, CS: Cesarean section.

Discussion

This study is the first to explore the predictors of the adequacy of perinatal care utilization using a validated index in the Nigerian context. The analyses showed that one-fifth (21.4%) of the women were high ('adequate plus' and 'excessive') utilizers. This figure tallies with the reported prevalence from other studies [4,7]. The subset of excessive utilizers, 53 (4.5%) was compared largely with adequate users to identify factors that could predict excessive prenatal care utilization in our setting, where the greater proportion, 1154 (97.6%), of obstetric patients utilize prenatal services by paying out-of-pocket.

Women who were in paid employment were more likely to utilize the services excessively. This is logical judging from the fact that they would more likely be able to afford the costs of care compared with their unemployed counterparts. In addition, findings from previous local and international studies have shown that maternal employment is associated with earlier gestational age at initiation of antenatal care [12-14], thus potentially increasing their service utilization. Besides, being between the age of 20 years to 39 years was significantly associated with high prenatal care usage. Apart from being the period of optimal reproductive potential, this is also the time of increased physical activity and productivity. Thus, hospital visits for both obstetric and non-obstetric conditions occurring in pregnancy would be greater. Also, maternal age has been found to influence the perception of pregnancy risk, while the latter strongly influences mothers' decisions regarding prenatal care and service utilization [15,16].

Our study found a significant relationship between previous cesarean birth and pre-eclampsia in the index pregnancy with excessive prenatal care utilization. The high-risk nature of these obstetric conditions would normally inform heightened fetomaternal surveillance, thus increasing utilization of prenatal services including the emergency department, materno-fetal medicine unit, and the labor room. Availability of emergency obstetric services manned by competent personnel will improve the obstetric and perinatal outcomes in women with these conditions, and promote safe motherhood.

High prenatal care utilizers were more likely to have cesarean delivery compared with adequate utilizers. Excessive antenatal service utilizers were more likely to visit the materno-fetal medicine unit [7], and cesarean section may be the safer option in such women with high-risk pregnancies. This could also explain why preterm births were significantly associated with excessive utilization of prenatal services. However, studies have also shown that non-urgent care received via the emergency department may not be in the best interests of the clients [17]. This is because physicians who have no prior knowledge of the patient's case, and insufficient time for examination and/or investigation may provide less than adequate care to them [9]. The fact that most excessive utilizers delivered before term, and via the abdominal route, may reflect this concern. Complication readiness and improved facilities for neonatal intensive care are advocated.

This study is not without limitations. The Kotelchuck Index employed in the categorizing of the women only deals with the adequacy of prenatal care utilization, and not the adequacy of content or quality. Further studies would be needed to evaluate the relationship between utilization, the content of prenatal care and perinatal outcome.

Conclusion

Pregnant women may utilize prenatal care excessively in our environment, especially those in paid employment, with pre-eclampsia and previous cesarean birth, resulting in an increased likelihood of preterm births and abdominal delivery. Complication readiness and advanced neonatal support facilities will lead to an improvement in perinatal outcome and promote safe motherhood.

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Conflict of interest

The authors declare that there are no competing interests regarding this work.

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