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Out-of-Hours Delivery and Pregnancy Outcomes Among Low-Risk Parturients in a Hospital Without Advanced Fetal Surveillance Technology

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Abstract

Purpose: The effect of out-of-hours delivery on obstetric and perinatal outcomes in centres without advanced fetal surveillance has not been fully explored.

Methods: Pregnancy, labour, and neonatal outcomes were compared for women who delivered ‘out-of-hours’ (00:00 – 07:59 hours) or at other times/‘within-hours’ (08:00 – 23:59 hours).

Results: Twenty-nine percent of the women studied had out-of-hours’ deliveries. Women who had reduced perception of fetal movements had more babies out-of-hours. Hypertensive disease in pregnancy and occurrence of at least one adverse obstetric outcome were associated with lower odds of out-of-hours’ birth. The mean duration of labour augmentation (minutes) was significantly longer in women who had out-of-hours’ delivery ($p = 0.032$). Vaginal birth ($p < 0.001$), fifth-minute APGAR scores at least 7 ($p = 0.038$), and augmentation of labour ($p = 0.041$) occurred commonly out-of-hours.

Conclusion: There was no evidence of poorer outcomes with out-of-hours’ births despite the absence of advanced fetal surveillance technology.

Keywords: Out-of-hours birth, obstetric outcomes, perinatal outcomes, advanced fetal surveillance, quality of care, Nigeria

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1 | INTRODUCTION

The working-hour phenomenon, a description of the adverse outcomes in facility-based

births that take place outside the routine work hours, suggests that quality of care of obstetric patients may not be uniform round the clock. (1), (2) Since the timing of labour falls outside the control of

the doctors (except for induced cases), medical and nursing staff in the labour rooms are generally busy throughout the day. (3) Studies have linked outcomes of care with institutional organizational characteristics and staff competence, (4) (5) (6) (7) (8) (9) (10) and these factors appear to be modulated by volume of clients/deliveries (11) time/day of birth, (12) , (13) availability of advanced surveillance techniques, and population/gestational ages of infants studied. (13) , (14) Furthermore, occupational stress has been shown to negatively impact on the sleep quality of nurses. This chronic sleep deprivation, which can occur with nurses on prolonged night shifts, can lead to diminished ability to function at work, and possibly poor birth outcomes. This may be particularly so in hospitals with high patient-to-nurse ratios. (15) , (16) However, other studies have found no association between time of conduct of obstetric procedures/deliveries and selected adverse perinatal outcomes. (17) (18) (19) (20) (21) (22)

Most health facilities in the same tier or cadre of service provision in Nigeria have similar organizational framework, with advanced fetal surveillance services being virtually non-existent, even in the tertiary facilities. Thirty-nine percent of the deliveries in Nigeria take place outside a health facility, with many of the parturients presenting for care after the occurrence of a complication ('unbooked' patients). Of the total deliveries in Nigerian public and private facilities, women with induced labour accounted for less than 10%, and only 3% occurred via caesarean section, with scheduled operations making up 1%. (23) Thus, a large number of births in Nigeria are unscheduled and occur around the clock.

Although there are data from audits of hospital performance using various indices in Nigeria, well-designed studies assessing the effect of time of de-

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livery on birth outcomes are sparse. What are the predictors of/factors associated with out-of-hours' deliveries in Nigeria? Does the general lack of advanced fetal surveillance technology have any impact on the pregnancy outcomes in out-of-hours' births? This study is aimed at providing answers to these questions, and suggesting appropriate recommendations for clinical practice.

2 | METHODS

This study was conducted in the Maternity wing of Ekiti State University Teaching Hospital (EKSUTH), Ado – Ekiti, south-western Nigeria. The 46-bedded public facility with a delivery rate of about 1,500/annum, provides specialist obstetric services to clients within Ekiti and its neighbouring states.

The study population included obstetric patients who either had antenatal care in EKSUTH or were referred from other maternity care providers following the onset of a complication during pregnancy/delivery. The Department of Obstetrics and Gynaecology, EKSUTH, daily reviews all obstetric cases attended to during the previous 24 hours. Thereafter, with the aid of a proforma, data including the socio-demographic characteristics, obstetric events, past medical and obstetric history, details of parturition and the puerperium, complications, and perinatal outcomes were extracted from records and nurses' sheets into a comprehensive database, by a full-time research assistant.

All deliveries occurring between October, 2013 and March, 2015 were purposively included in the study. However, women with incomplete details, who had severe medical conditions or died during pregnancy or childbirth were excluded from this study. At the time of this study, the hospital did not have facilities for advanced fetal surveillance, and almost all the patients had to pay for prenatal care and delivery services out-of-pocket. Of the 2,077 births that occurred during the period, 1,807 deliveries met the inclusion criteria, and were therefore included in the study and analyses. The institution's Ethics and Research Committee gave approval for the study.

In this study, the following definitions were used: booked clients had prenatal care at EKSUTH, while

‘unbooked’ patients had no antenatal care, or were referred to EKSUTH from other maternity facilities when pregnancy or labour became complicated. ‘Out-of-hours’ deliveries were those that occurred between 00:00 hours and 07:59 hours the following day, a period that forms part of the doctors’ call duties and nurses’ night shifts in the Nigerian health care system. Hypertensive disorders included the spectrum of chronic hypertension, pregnancy-induced hypertension and pre-eclampsia. Rupture of the fetal membranes was regarded as premature when it occurred before the onset of labour. (24) Babies with weights less than the 10th centile for the gestational age were regarded as having intrauterine growth restriction. (25) The Composite Adverse Obstetric Outcome referred to the occurrence of at least one of the following: hypertensive disorder in the index pregnancy, human immune deficiency virus (HIV) infection, premature rupture of membranes and intrauterine growth restriction. Still born babies did not have any signs of life at delivery. Early neonatal death referred to demise that occurred within the first week of life, and perinatal mortality was the sum of stillbirths and early neonatal deaths. The attending midwife or paediatrician assigns the APGAR Scores at the first and fifth minutes of baby’s life. The Composite Adverse Perinatal Outcome involved the occurrence of at least one of the following: 5-minute APGAR Score below 7, stillbirth or admission into the neonatal intensive care unit within 72 hours of birth.

The extracted data were entered into, and analyses done using, the Statistical Software for the Social Sciences (SPSS) package version 20. Pearson’s Chi-square (and whenever appropriate, Fisher’s exact) test was used to explore the association between maternal sociodemographic and baseline pregnancy characteristics with out-of-hours’ delivery. Multivariate regression model was employed to identify the obstetric and perinatal outcomes independently associated with births occurring out-of-hours in our institution. These were adjudged significant when $p < 0.05$.

3 | RESULTS

Of the 1,807 patients eligible for inclusion in the study, 524 (29%) had out-of-hours’ deliveries. The mean age of the women was 30.0 ± 4.7 years, with a range of 14 – 49 years. Eight hundred and twenty-five (45.7%) women were below 30 years, while the majority, 1666 (92.2%) were of Yoruba extraction. Most of the participants were employed 1414 (78.3%), married 1757 (97.2%) and multiparous 1058 (58.6%) women, but without health insurance package 1775 (98.2%). At least three-quarters (76.4%) were educated to the tertiary level, and more than two-thirds 1244 (68.8%) were booked for prenatal care at EKSUTH (Table 1).

The association between patients’ characteristics and out-of-hours’ delivery was highlighted in Table 2. All the sociodemographic characteristics of women who had out-of-hours’ births were comparable with those of the women who did not. Significantly more women who had reduced perception of fetal movements were delivered out-of-hours (6.5% versus 3.6%; odds ratio: 1.866, $p = 0.008$). Women with hypertensive disease in the pregnancies studied (3.2% versus 6.7%; odds ratio: 0.467, $p = 0.004$) and those with at least one adverse obstetric outcome (9.5% versus 14.6%; odds ratio: 0.618, $p = 0.004$) had lower odds of delivering out-of-hours.

Table 3 displayed the results of the multivariate logistic regression analysis of the pregnancy outcomes following out-of-hours’ delivery. Women who delivered out-of-hours were more likely to have augmentation of labour (crude odds ratio [COR]: 0.73; 95% confidence interval [CI]: 0.58 – 0.93, $p = 0.009$), vaginal birth (COR: 1.70; 95% CI: 1.36 – 2.12, $p < 0.001$) of term babies (COR: 1.38; 95% CI: 1.01 – 1.87, $p = 0.041$), with fifth-minute APGAR scores at least 7 (COR: 1.65; 95% CI: 1.07 – 2.52, $p = 0.023$), and less likely to have at least one adverse perinatal outcome on the composite scale (COR: 1.38; 95% CI: 1.01 – 1.89, $p = 0.046$). The mean duration of labour augmentation (minutes) was significantly longer in women who had out-of-hours’ delivery (275 ± 190 versus 324 ± 205 , $p = 0.032$). However, when the confounders were kept constant, vaginal birth (adjusted odds ratio [AOR]: 1.65; 95% CI: 1.32 – 2.06, $p < 0.001$), fifth-minute APGAR

scores at least 7 (AOR: 1.94; 95% CI: 1.04 – 3.62, p = 0.038), and augmentation of labour (AOR: 0.78; 95% CI: 0.61 – 0.99, p = 0.041) were found to be independently associated with out-of-hours' birth.

Table 1: Distribution of the patients

Characteristics	Categories	Frequency	Percentage
Age (years)	< 30	825	45.7
	= 30	982	54.3
Mean age ± SD (Range)		30.0 ± 4.7 (14 – 49)	
Parity	0	715	39.6
	1 – 4	1058	58.6
	= 5	34	7.9
Employment status	Unemployed	393	21.7
	Employed	1414	78.3
Ethnicity	Yoruba	1666	92.2
	Non-Yoruba	141	7.8
Marital status	Single	50	2.8
	Married	1757	97.2
Level of education	At most, Secondary	427	23.6
	Tertiary	1380	76.4
Employment status (Husband)	Unemployed	109	6
	Employed	1698	94
Health insurance	No	1775	98.2
	Yes	32	1.8
Booking status	Unbooked	563	31.2
	Booked	1244	68.8
Out-of-hours' birth	No	1283	71
	Yes	524	29

Table 2: Association between sociodemographic and clinical characteristics of the patients with out-of-hours' delivery

Characteristics	Out-of-hours delivery		χ ²	Odds Ratio (95% C.I.)	p-value
	No n (%)	Yes n (%)			
AGE (years)					
< 30	570 (44.4)	255 (48.7)	2.692	0.843 (0.688 – 1.034)	0.101
= 30	713 (55.6)	269 (51.3)			
PARITY					
0	496 (38.7)	219 (41.8)	2.453		0.293
1 – 4	765 (59.6)	293 (55.9)			
= 5	22 (1.7)	12 (2.3)			
MATERNAL EMPLOYMENT STATUS					
Unemployed	270 (21)	123 (23.5)	1.290	0.869 (0.682 – 1.107)	0.256
Employed	1013 (79)	401(76.5)			
ETHNICITY					
Yoruba	1178 (91.8)	488 (93.1)	0.893	0.828 (0.559 – 1.226)	0.345
Non-Yoruba	105 (8.2)	36 (6.9)			
MARITAL STATUS					
Single	33 (2.6)	17 (3.2)	0.625	0.781 (0.435 – 1.426)	0.429
Married	1250 (97.4)	507 (96.8)			
EMPLOYMENT STATUS (HUSBAND)					
Unemployed	76 (5.9)	33 (6.3)	0.092	0.937 (0.614 – 1.429)	0.762
Employed	1207 (94.1)	491 (93.7)			
LEVEL OF EDUCATION					
= Secondary	317 (24.7)	110 (21)	2.846	1.235 (0.966 – 1.579)	0.092
Tertiary	966 (75.3)	414 (79)			
HEALTH INSURANCE					
No	1258 (98.1)	517 (98.7)	0.803	0.681 (0.293 – 1.585)	0.436 ^a
Yes	25 (1.9)	7 (1.3)			
BOOKING STATUS					
Unbooked	403 (31.4)	160 (30.5)	0.133	1.042 (0.836 – 1.298)	0.715
Booked	880 (68.6)	364 (69.5)			
PAST MEDICAL HISTORY					
None	1231 (95.9)	508 (96.9)	1.026	0.746 (0.422 – 1.318)	0.343 ^a
= 1	52 (4.1)	16 (3.1)			
HISTORY OF STILLBIRTH					
Yes	64 (5)	17 (3.2)	2.643	0.639 (0.370 – 1.101)	0.132 ^a
No	1219 (95)	507 (96.8)			
REDUCED FETAL MOVEMENT					
Yes	46 (3.6)	34 (6.5)	7.411	1.866 (1.183 – 2.942)	0.008 ^{a*}
No	1237 (96.4)	490 (93.5)			
HYPERTENSIVE DISEASE IN PREGNANCY					
Yes	86 (6.7)	17 (3.2)	8.280	0.467 (0.275 – 0.793)	0.004 ^{a*}
No	1197 (93.3)	507 (96.8)			
HIV INFECTION					
Yes	14 (1.1)	7 (1.3)	0.194	1.227 (0.493 – 3.058)	0.660
No	1269 (98.9)	517 (98.7)			
PREMATURE RUPTURE OF FETAL MEMBRANES					
Yes	75 (5.8)	23 (4.4)	1.538	0.739 (0.458 – 1.193)	0.215

Table 3: Logistic regression analyses of obstetric and perinatal outcomes

Outcomes	Out-of-hours delivery		Crude odds ratio (95% C.I.)	p-value	Adjusted odds ratio (95% C.I.)	p-value
	No n (%)	Yes n (%)				
INDUCTION OF LABOUR						
Yes	139 (69.5)	61 (30.5)	1.00			
No	1144 (71.2)	463 (28.8)	0.92 (0.67-1.27)	0.620		
AUGMENTATION OF LABOUR						
Yes	270 (65.9)	140 (34.1)	1.00		1.00	
No	1013 (72.5)	384 (27.5)	0.73 (0.58-0.93)	0.009*	0.78 (0.61-0.99)	0.041*
DURATION OF AUGMENTATION (minutes)						
Mean ± SD	275 ± 190	324 ± 205	-2.148 ^t			0.032*
MODE OF DELIVERY						
Abdominal	520 (77.6)	150 (22.4)	1.00		1.00	
Vaginal	763 (67.1)	374 (32.9)	1.70 (1.36-2.12)	<0.001*	1.65 (1.32-2.06)	<0.001*
MODE OF DELIVERY						
Emergency CS	375 (75)	125 (25)	1.00		1.00	
Vaginal birth	763 (67.1)	374 (32.9)	1.47 (1.16-1.86)	0.001*	1.43 (1.13-1.82)	0.004*
Elective CS	145 (85.3)	25 (14.7)	0.52 (0.32-0.83)	0.006*	0.52 (0.33-0.84)	0.007*
ESTIMATED BLOOD LOSS (EBL) [millilitres]						
Mean ± SD	495 ± 410	448 ± 312	1.315 ^t			0.189
SEX						
Male	689 (71.5)	275 (28.5)	1.00			
Female	594 (70.5)	249 (29.5)	1.05 (0.86-1.29)	0.637		
BIRTHWEIGHT (grammes)						
< 2500	161 (76.7)	49 (23.3)	1.00			
2500-3999	1071 (70.2)	454 (29.8)	1.39 (0.99-1.95)	0.055		
= 4000	51 (70.8)	21 (29.2)	1.35 (0.74-2.47)	0.324		
NEONATAL INTENSIVE UNIT ADMISSION						
Yes	154 (74)	54 (26)	1.00			
No	1129 (70.6)	470 (29.4)	1.19 (0.86-1.65)	0.305		
GESTATIONAL AGE AT DELIVERY (weeks)						
28-36	198 (75.9)	63 (24.1)	1.00		1.00	
37-41	1008 (69.6)	441 (30.4)	1.38 (1.01-1.87)	0.041*	1.38 (0.93-2.06)	0.110
= 42	77 (79.4)	20 (20.6)	0.82 (0.46-1.44)	0.484	0.84 (0.45-1.57)	0.593
STILLBIRTH						
Yes	47 (74.6)	16 (25.4)	1.00			
No	1236 (70.9)	508 (29.1)	1.21 (0.68-2.15)	0.522		
STILLBIRTH						
Intrapartum	8 (80)	2 (20)	1.00			
Antepartum	39 (73.6)	14 (26.4)	1.44 (0.27-7.59)	0.670		
Live birth	1236 (70.9)	508 (29.1)	1.64 (0.35-7.77)	0.530		
EARLY NEONATAL DEATH						
Yes	11 (84.6)	2 (15.4)	1.00			
No	1272 (70.9)	522 (29.1)	2.26 (0.50-10.22)	0.291		
PERINATAL MORTALITY						
Yes	58 (76.3)	18 (23.7)	1.00			
No	1225 (70.8)	506 (29.2)	1.33 (0.78-2.28)	0.298		
5-MINUTE APGAR SCORE						
< 7	109 (79.6)	28 (20.4)	1.00		1.00	
= 7	1174 (70.3)	496 (29.7)	1.65 (1.07-2.52)	0.023*	1.94 (1.04-3.62)	0.038*
COMPOSITE ADVERSE PERINATAL OUTCOME						
= 1	185 (76.4)	57 (23.6)	1.00		1.00	
None	1098 (70.2)	467 (29.8)	1.38 (1.01-1.89)	0.046*	0.78 (0.45-1.34)	0.364

*significant at p < 0.05; CS: caesarean section; ^tIndependent samples' t test

4 | DISCUSSION

Twenty-nine percent of all births studied occurred out-of-hours. Another study from south-eastern Nigeria found that 27.8% of the deliveries studied took place during the weekends. (18) Also, 29.8% of babies in an American institution were delivered out-of-hours, (22) while about 20% of very low birth-weight babies born in California or Pennsylvania between 2002 and 2009 were delivered during off-peak hours (between midnight and 7:00 am). (14) Since a significant proportion of facility-based deliveries occur during periods with potentials for missed care, each obstetric facility should regularly audit its performance with the aim of promoting safe motherhood.

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Women with complaints of reduced fetal movements were more likely to be delivered out-of-hours. A previous study from this study's location concluded that

the mothers had unsatisfactory knowledge and poor perception of abnormalities of fetal movements in the third trimester, with consequent delay in its identification and decision to seek in-hospital care. (26) If abnormal fetal movements are not identified early, pregnant women are more likely to present for care out-of-hours, leading to immediate delivery because of the absence of advanced fetal surveillance techniques in the study's setting.

The occurrence of hypertensive disease and at least one disorder out of the composite adverse obstetric outcomes led to a lower likelihood of having an out-of-hours' birth. When these disorders were diagnosed, a plausible explanation was that the prenatal caregivers scheduled the delivery of the women, reducing the likelihood of delivery out-of-hours. A case-control study, involving 65 women scheduled for induction of labour using two protocols, showed that those participants who were admitted and had cervical

ripening the day before induction had significantly lower overall number of out-of-hours' deliveries and emergency caesarean sections when compared with the women who were admitted on the day of induction. (27)

Parturients who delivered out-of-hours were more likely to have labour augmentation. Also, women who delivered out-of-hours had significantly longer duration of augmentation than those whose deliveries occurred within-hours. We could suggest two likely scenarios that might explain these findings. Due to the greater number of available personnel and on-site presence of consultants during the day, women who need augmentation within-hours will get it. Most of these will result into vaginal or abdominal deliveries before midnight. Others will continue and are delivered out-of-hours. This is corroborated

by the finding of longer duration of augmentation in out-of-hours deliveries. Secondly, the recourse to caesarean section may be delayed in women labouring out-of-hours, because there is a tilt towards 'persevering' with labour/augmentation due to the smaller numbers of personnel and the availability of mostly junior-cadre staff.

From the index study, vaginal births were commoner among the babies born out-of-hours. An English study of over 5 million singleton births found that spontaneous births following spontaneous onset of labour were more likely to occur between midnight and 6 am than at other times of the day. (28) We also found that babies with APGAR scores at least 7 at 5th minute of life were significantly more out-of-hours. Although other studies have documented findings to the contrary, (2) (12) , (29) the variation might not be unconnected with the availability or otherwise of advanced fetal surveillance and resuscitative gadgets. (30) For example, the increased risk of neonatal mortality that occurred in late night births in California was observed in hospitals that provided advanced neonatal intensive care, but not in facilities that provided primary care. (31) Our findings could be because more difficult cases were likely to be tackled within-hours, since a supervising consultant was more frequently available during the day. (17) In other words, as a Japanese study also noted, the rate of delivery of high-risk pregnancies was low during the nighttime. (32) Also, more referrals on account of pregnancy/labour complications occurred during the day. These may result in a higher number of operative deliveries during the day, and proportionately more babies with lower APGAR scores. (33) , (34)

This study, though limited in its generalizability by the reliance on data from a single health facility, cuts across the spectrum of perinatal care over an appreciable period of time in the State's apex health institution. Also, the deductions were based on inferential statistical analyses.

A panorama of the findings from this survey suggests that the perinatal care delivery structure in the study location during the study period did not result in poorer outcomes in births that occurred out-of-hours, despite the absence of advanced fetal surveillance technology. Further comprehensive and

focused studies, using tools like the Perinatal Missed Care Survey, could identify missed nursing care of women and provide robust data on the quality of care during facility-based deliveries. (35) , (36) .

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