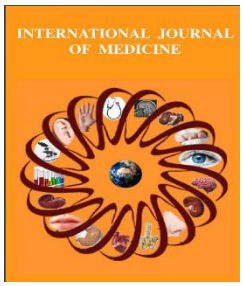

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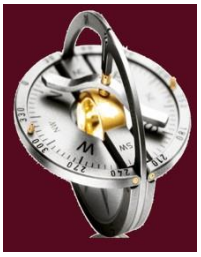

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Original Article

Determinants of hospital utilization after maternal falls in southern Nigeria

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Abstract

Background: Falls are the commonest cause of minor injuries during pregnancy. However, even apparently minor impact can be associated with serious obstetric complications, informing the need for hospital utilization. This study is designed to identify predictors of hospital utilization after maternal falls.

Methods: Using data from the inquiry into accidental maternal falls in Ado – Ekiti Local Government Area 2019 database, we compared hospital utilization and non-utilization after falls during pregnancy. The Abbreviated Injury Scale (AIS), an anatomical scoring system of the Association for the Advancement of Automotive Medicine, was employed to rank the injuries from the falls on a scale of 1 (minor) to 6 (unsurvivable).

Results: Hospital utilization rate was 27%; at least one-tenth of the injuries scored 3 or more on the AIS. Women who were married to professionals (30.7% versus 16.7%, p = 0.024) and had a family income in the highest quintile (12% versus 6.4%, p = 0.038) were more likely to seek medical care after a fall during pregnancy. Also, significantly more women visited the hospital when their injury was rated 4 (4% versus 2%, p = 0.001), especially when it involved the abdomen (22.7% versus 6.4%, p < 0.001). Logistic regression showed that 'serious' AIS score (adjusted odds ratio [AOR]: 7.42; 95% C.I. 2.71 – 20.34, p < 0.001), and abdominal involvement (AOR: 3.68; 95% C.I. 1.57 – 8.65, p = 0.003) independently predicted hospital utilization after maternal falls.

Conclusions: Provision of comprehensive and affordable healthcare, targeting women for pre-conceptional education to modify their perception about falls and providing information to pregnant women about care after falls could improve hospital utilization and reduce fall-related adverse pregnancy outcomes.

Keywords: abbreviated injury scale, accidental falls, emergency service, Nigeria, pregnancy

Introduction

Traumatic maternal injuries occur in 5% to 7.4% of pregnancies from various population-based studies, with falls being the commonest mechanism of injury [1–3]. These injuries result in hospitalizations in pregnant women, with 37.7% of the hospital admissions ending in

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delivery of the babies [4]. This is because of the increased risk of obstetric (such as ruptured membranes, preterm labor or placental abruption) and fetal (distress and death) complications associated with the injuries [5–7].

Although non-fatal maternal injuries are the commoner variant, the burden is likely to be under-estimated because they are less severe, may not need hospitalization and thus, go unreported [1]. However, even relatively minor injuries and impact to the abdomen can result in enough force to shear placental attachments, causing adverse pregnancy outcomes [8]. Thus, it is pertinent to seek medical care after injuries in pregnancy, in order to ascertain maternal and fetal well-being. Although the prevalence, hospitalizations and outcomes of more severe injuries in pregnancy have been documented [6,7,9–11], there are no studies from Nigeria identifying the predictors of hospital utilization after falls in pregnancy. Understanding the factors that influence healthcare-seeking behavior after maternal falls is essential to ensuring healthy pregnancies and safe deliveries. This study has been designed to address this knowledge gap.

Methods

This study was a cohort survey that utilized the comprehensive database of the government-approved inquiry into accidental maternal falls in Ado – Ekiti Local Government Area of Ekiti State 2019, between February 1st and March 31st, 2019. Ethical approval for the study was obtained from the Ethics and Research Committee of the Ekiti State University Teaching Hospital, Ado – Ekiti, and the National Primary Health Care Development Agency, Ekiti State (under the Ekiti State Ministry of Health).

The subset of women who reported falls in pregnancy was identified and they constituted the study population. They were stratified into two groups based on their hospital utilization after the fall. Those who were on medications for hypertension, diabetes or epilepsy during pregnancy were excluded from the study. This study was conducted in accordance with the Declaration of Helsinki and informed consent was duly obtained.

Information sought included the socio-demographic variables, household economic structure, pregnancy intention and alcohol use during pregnancy. The socioeconomic class was calculated after the model by Olusanya et al, with I being the highest and V the least [12]. Also, the number of falls and the gestational age of the latest fall (if they fell more than once) were noted. The Abbreviated Injury Scale (AIS), an anatomical scoring system of the Association for the Advancement of Automotive Medicine, was employed to rank the injuries from the falls on a scale of 1 (minor) to 6 (unsurvivable). The AIS is a representation of the 'threat to life' associated with an injury and is not meant to serve as a comprehensive measure of severity [13]. The responses of the women to enquiries about what they did after a fall were operationalized into 'went to the hospital,' if they sought care in a health facility, and 'did not visit the hospital,' if they did not seek medical care, or visited faith homes, patent medicine sellers, or traditional birth attendants. This was the dependent variable. The independent variables were extracted from the other characteristics of the respondents obtained from the database.

The retrieved data was coded into and analyzed using the Statistical Software for the Social Sciences (SPSS) package version 20 (IBM, Chicago IL, USA). Pearson's Chi-Square was used to test the univariate association of the variables with hospital utilization. Variables with p-value < 0.05 were included in the multivariate logistic regression model to identify the predictors of hospital utilization after maternal falls. Confidence intervals were calculated at the 95% level.

Results

Two hundred and seventy-eight healthy women who reported at least a fall during pregnancy were eligible for inclusion in the study population. Of these, seventy-five (27%) sought care in the hospital after the fall, while 203 (73%) did not.

Table 1 displayed the distribution of the respondents according to their AIS score. Almost half of the women had moderate injuries 135 (48.6%), with 7 (2.5%) of the injuries being severe and 113 (40.6%) ranked as minor.

Table 1. Distribution of Abbreviated Injury Scale (AIS) scores of the respondents

Injury	AIS score	Frequency	Percent
1	Minor	113	40.6
2	Moderate	135	48.6
3	Serious	23	8.3
4	Severe	7	2.5
5	Critical	0	0
6	Unsurvivable	0	0
Total		278	100

Table 2. The socio-demographic, obstetric and trauma characteristics of the respondents

Variables	Hospital utilization after maternal fall		p-value
	No (n = 203)	Yes (n = 75)	
	Number (%)	Number (%)	
Maternal age (years)			
< 35	152 (74.9)	60 (80)	0.373
≥ 35	51 (25.1)	15 (20)	
Level of education			
< Secondary	4 (2)	5 (6.7)	0.050
≥ Secondary	199 (98)	70 (93.3)	
Marital status			
Single	3 (1.5)	2 (2.7)	0.508
Married	200 (98.5)	73 (97.3)	
Residence			
Rural	83 (40.9)	28 (37.3)	0.591
Urban	120 (59.1)	47 (62.7)	
Husband's occupation			
Professional	34 (16.7)	23 (30.7)	0.024*
Skilled	55 (27.1)	13 (17.3)	
Trained/Artisan	114 (56.2)	39 (52)	
Monthly income ($)			
≤ 149	89 (43.8)	31 (41.3)	0.038*
150 – 299	67 (33)	14 (18.7)	
300 – 449	27 (13.3)	15 (20)	
450 – 599	7 (3.4)	6 (8)	
≥ 600	13 (6.4)	9 (12)	
Socioeconomic class			
I	28 (13.8)	19 (25.3)	0.094
II	55 (27.1)	15 (20)	
III	69 (34)	20 (26.7)	
IV	48 (23.6)	18 (24)	
V	3 (1.5)	3 (4)	
Alcohol consumption in pregnancy			
No	195 (96.1)	69 (92)	0.170
Yes	8 (3.9)	6 (8)	
Pregnancy intention			
Unwanted	169 (83.3)	60 (80)	0.528
Wanted	34 (16.7)	15 (20)	
Parity			
Primiparity	63 (31)	18 (24)	0.252
Multiparity	140 (69)	57 (76)	
Gestational age at fall			
1st trimester	14 (6.9)	4 (5.3)	0.864
2nd trimester	78 (38.4)	28 (37.3)	
3rd trimester	111 (54.7)	43 (57.3)	
Number of falls			
1	134 (66)	55 (73.3)	0.245
≥ 2	69 (34)	20 (26.7)	

AIS score			
1	94 (46.3)	19 (25.3)	0.001*
2	95 (46.8)	40 (53.3)	
3	10 (4.9)	13 (17.3)	
4	4 (2)	3 (4)	
Injured body part			
Abdomen	13 (6.4)	17 (22.7)	<0.001*
Hands/legs	121 (59.6)	32 (42.7)	0.012*
Others	68 (33.5)	27 (36)	0.696

*significant at $p < 0.05$.

The socio-demographic, obstetric and trauma characteristics of the respondents are shown in Table 2. The mean age of the women was 30.26 ± 4.93 years, with a range of 17 – 49 years. Mothers who utilized the hospital after a fall were significantly in the highest income quintile (12% versus 6.4%, p = 0.038), and with husbands who were professionals (30.7% versus 16.7%, p = 0.024) compared with those who did not utilize the hospital. Significantly more women whose injuries were ranked as 'severe' (4% versus 2%, p = 0.001), and with injuries to the abdomen (22.7% versus 6.4%, p <0.001) went to the hospital compared with non-hospital users, while those with injuries to the extremities (hands/legs) were less likely to use hospital services after a fall (42.7% versus 59.6%, p = 0.012). Both groups were comparable with respect to age, parity, marital status, gestational age at fall, place of residence and pregnancy intention.

Table 3. Predictors of hospital utilization after maternal falls

Variables	Adjusted odds ratio	95% Confidence interval	p-value
Husband's occupation			
Professional	1.87	0.92 – 3.79	0.084
Skilled	0.67	0.31 – 1.43	0.300
Trained/Artisan	1.00		
Monthly income ($)			
≤ 149	1.00		
150 – 299	0.73	0.35 – 1.56	0.416
300 – 449	1.58	0.70 – 3.58	0.269
450 – 599	2.47	0.70 – 8.80	0.162
≥ 600	2.08	0.77 – 5.65	0.150
AIS score			
1	1.00		
2	2.21	1.16 – 4.19	0.016*
3	7.42	2.71 – 20.34	<0.001*
4	5.00	0.98 – 25.53	0.053
Injured body part			
Abdomen	3.68	1.57 – 8.65	0.003*
Hands/legs	0.61	0.31 – 1.21	0.156
Others	1.00		

*significant at $p < 0.05$.

In Table 3, the results of the multivariate logistic regression analysis of the variables significantly associated with hospital utilization are shown. Independent predictors of hospital utilization following a fall were 'serious' AIS ranking (adjusted odds ratio: 7.42; 95% C. I. 2.71 – 20.34, p <0.001), and abdominal involvement during the fall (adjusted odds ratio: 3.68; 95% C. I. 1.57 – 8.65, p = 0.003).

Discussion

This survey is the first to identify the predictors of hospital utilization after falls during pregnancy in southern Nigeria. From our study, almost nine out of ten injuries (89.2%) were < 3 on the AIS and 40.6% of the reported injuries were minor, corroborating other studies that found that falls were the commonest cause of minor injuries during pregnancy, constituting 17 – 39% of trauma-related hospitalizations and emergency room visits [14–19]. However, with 10.8% of the injuries being serious or severe, the need for hospital visits to at least confirm fetal and maternal safety cannot be over-emphasized.

Women whose husbands were professionals were more likely to seek medical care after falls in pregnancy. These professionals were likely to have a greater awareness of the health implications of maternal falls and the financial resources to defray the medical care costs. This latter suggestion was highlighted by the finding that women whose family income was in the highest quintile sought medical care after a fall than those in the lowest quintile. This agrees with findings that poor people were less likely to seek care in a health facility during illness [20–23]. The implementation of a comprehensive health insurance scheme might help to bridge the gap between the wealthy and the poor in terms of health care access.

As revealed by our study, as the injury severity increases, the proportion of women seeking care in the hospitals also increased. Harland et al found that nearly 85% of women sought medical care following injuries sustained during pregnancy, with more than two-thirds visiting an emergency room [1]. Although we found an association between injury severity and health-care-seeking behavior, only 27% of the women who fell during pregnancy went to the hospital. Women's belief systems could influence their perception of the riskiness of their falls, which by extension can affect their tendency to utilize health services [24]. Preconception perception can be modified through education with the possibility of improving the healthcare-seeking behavior of the women during pregnancy.

More respondents in the index survey went to the hospital when the injuries involved the abdomen than those who did not. This could be related to the perceived risks of abdominal injuries in pregnancy with the possibility of negative perinatal outcomes. Finally, our survey found that the independent predictors of hospital utilization after maternal falls were the severity of injuries sustained and the involvement of the abdomen during a fall.

While this survey may be limited by its sample size, the effect of this has been mitigated by the use of multivariate logistic regression analyses. Thus, the results are generalizable to populations of women with similar characteristics to our respondents.

Conclusion

The health-seeking behavior of our pregnant population after accidental falls was influenced by injury-related factors. Although most of the injuries sustained were less than 3 on the AIS, the occurrence of serious and severe injuries in at least one-tenth of the women suggests that hospital utilization to ascertain maternal and fetal wellbeing should be encouraged. The more severe the injuries sustained after a fall, the more the likelihood of hospital utilization, especially when the injuries also involved the abdomen. Targeting women for pre-conceptional education to modify their perception about falls and providing information to pregnant women about care after falls could improve hospital utilization and reduce fall-related adverse pregnancy outcomes.

Conflict of interest

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

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