Maternal predictors of mode of delivery: A retrospective study

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Abstract

Background: Mode of delivery (MOD) which could be via caesarean section or vaginal have been associated with maternal predictors such as age, mean arterial blood pressure (MAP), weight, height, marital and employment status. It is imperative to study these maternal variables as to establish a comprehensive ante natal care (ANC) surveillance system to assist in reduction of risk associated with delivery. The objective of the study is to determine effects of maternal variables such as age, height, weight, mean arterial blood pressure, marital and employment status on MOD by a pregnant woman.

Material and method: The study was a descriptive retrospective study conducted at general hospital Bonny, in Bonny Island Rivers State Nigeria. The study involved retrospective data collection from the records of participants kept at the records department. Study population included all eligible pregnant women who presented for antenatal care (ANC) and also had their babies delivered at the hospital from 1st January 2015 to 31st December 2020. Results were presented in simple frequency distribution table while multivariate logistics regression analysis was done to determine continuous variables which were significant at p value less than or equal 0.05 level. Also, bivariate analysis with chi-square test was done for categorical data with level of statistical significance set at less than or equal 0.05.

Results: Results revealed statistically significant association between maternal MAP, age, marital and employment status with CS as MOD.

Conclusion: Maternal variables such as age, MAP, marital and employment status can be used as predictors of MOD

Keywords: Caesarean section, mode of delivery, maternal predictors, age, mean arterial blood pressure, marital, employment status.

Introduction

Scholarly articles have associated some maternal factors with mode of delivery (MOD) which could

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be via caesarean section (emergency or elective), or vaginal (assisted or spontaneous). It is therefore imperative to study these factors which may inadvertently affect MOD. This will assist to establish a comprehensive perinatal care strategy to reduce risk associated with delivery.[1] It has been suggested that adverse MOD such as caesarean section (CS) has deleterious effect on mother and child.[2] It therefore, beholds the need to heighten antenatal care (ANC) surveillance in order to

identify these risk factors early in pregnancy and to institute a consistent and sustainable strategy which will help in optimization of maternal health services.[3] Rates of CS have been increasing around the world over the years. Global rates increased from 12.1% in 2000 to 21.1% in 2015.[4] In Brazil CS rates reached as high as 53.3% of all deliveries in 2010 and increased to 55.4% in 2016.[5] In South Asia, CS doubled from 2000 to 2015, with an average rising rate exceeding 5%. This reveals that the lifesaving procedure is practiced more than expected.[4] Approximately 18.5 million CS are performed annually.[6] It has been observed that there has been an overall higher CS rate for sub-Saharan Africa, Somali and south Asia women.[7] Studies reveals a global annual rate of increase of CS by 4.4% between 1990 and 2014, with Latin America and Caribbean registering highest absolute rate of 19.4%.[8] Interestingly, world health organization (WHO) recommends prevalence of 10 and 15% for CS.[9] Reports shows that at prevalence above these thresholds, there is no longer an association between reduced maternal and infant mortality and increasing CS rate.[10] However, a low prevalence suggests inadequate access to CS,[11] while a high prevalence have shown not to improve perinatal outcome and have been associated with adverse health effects for mother and offspring.[11,12] Regrettably, despite argument for and against increasing rate of CS, one major disadvantage is its high financial burden on families, especially poor families living in low- and middle-income countries.[13] Therefore, to curb this burden, research into maternal factors which predicts MOD by CS should be vigorously and emphatically pursued and encouraged.

Literatures have highlighted several predictors of MOD in pregnant women. Hypertension in pregnant women have been associated with CS.[3] It is also worthy to emphasize that all forms of hypertension in pregnancy have significant association with CS; pulmonary,[14] pre-eclampsia,[15] Gestational,[16] and chronic.[17] Maternal ages have also shown strong significant association with CS.[18,19] It was revealed that advanced maternal age (AMA) was associated with increased rate of CS.[20] Furthermore, scholarly paper has significantly associated CS with maternal variables such as height,[18,21,22] and weight.[1,23,24] Contrastingly, opinion

differs among some researchers on the effect of these variables on MOD.[25,26]

The objective of this research therefore is to determine the effect of maternal variables such as weight, height, age, MAP, marital and employment status on MOD by a pregnant woman. The relevance of this research was anchored on the need to identify predictors which will assist in heightening surveillance to improve maternal and child health. Furthermore, some authors have suggested that CS may be harmful to mother and child, as a result, the topic have been a subject of vehement and intense debate in recent years,[2] hence the need for more research. It is therefore justifiable to identify factors which could predict CS and minimize unnecessary use of this procedure and to increase use when absolutely needed,[27] most importantly considering the cost effect on poor families under extreme financial pressure.[13]

Materials and methods

The study was a descriptive retrospective study conducted at general hospital Bonny, in Bonny Island Rivers State, Nigeria. The study involved retrospective data collection from the records of participants kept at the records department of the hospital. Study population included all eligible pregnant women who presented for antenatal care (ANC) and also had their babies delivered at the hospital. Data for the research was derived from existing records in the past six years, from 1st January 2015 to 31st December 2020. Records were scrutinized for completeness and records without complete data on variables required were excluded. Also excluded, were records which revealed medical condition which could influence MOD such as diabetes mellitus, HIV, cardiovascular disease except hypertension, previous CS etc. Participants for the study were enlisted based on their records until the required sample size was achieved. A total sample size of 400 was achieved after making adjustment for attrition using sample size determination for descriptive study.

Data were collected on socio demographics, independent variable such as maternal height, weight, age and mean arterial blood pressure, while output variable was MOD. Results were presented in simple frequency distribution table. Correlation coefficient was used to determine variables that

were significantly correlated with dependent variable while multiple regression analysis was done to determine continues variables which were significant at p value less than or equal 0.05 level. Also, bivariate analysis with chi-square test was done for categorical data with level of statistical significance set at less than or equal 0.05.

Data collected was cleaned, coded and entered into excel work book and was transported into statistical package for social sciences (SPSS) version 23.0 standard edition for statistical analysis. Permission for the study was granted by the management of Rivers State Hospital management board while ethical approval for the study was given by the ethical review committee of Rivers State Hospital Management Board.

Few limitations which could bias the study were encountered which includes time of measurement of maternal weight. It was recommended that data for maternal weight be retrieved at term. Records which did not meet these criteria were also excluded.

Results
Table I: Socio-demographic characteristics
About 200 (50.0%) of Women within the age group 21-30 years dominated the study while 6 (1.5%) of women above 41 years were the least. Majority 182 (45.5%) of the women were Business women while 281 (70.1%) of the study participants were married

Table II: Maternal predictors and mode of delivery 1
Women within the weight range 65-79kg were the most predominant 166 (41.5%) in the group while 235 (58.8%) of the study population had MAP 166-170 mmHg.

Table I: Socio-demographic characteristics

Variables	N =400
Age (years)	**Freq. (%)**
=20	36 (9.0)
21 – 30	200 (50.0)
31 -40	158 (39.5)
=41	6 (1.5)
Occupation	
Unemployed	60 (15.0)
Student	74 (18.5)
Business woman	182 (45.5)
Public servant	84 (21.0)
Religion	
Christian	390 (97.5)
Islam	8 (2.0)
Others	2 (0.5)
Tribe	
Igbo	74 (18.5)
Ijaw	260 (65.0)
House	12 (12.0)
Efik	48 (12.0)
Others	6 (1.5)
Marital status	
Single	115(28.7)
Married	281(70.3)
Cohabitation	2 (0.5)
Divorced	2 (0.5)

Table II: Maternal predictors of mode of delivery 1

Variables Maternal weight(Kg)	N =400 Freq.(%)	Mean	Minimum	Maximum	Range
<65	52(13.0)				
65 – 79	166(41.5)	78.3±13.7	50	115	65
80 – 94	126(31.5)				
95 – 110	52(13.0)				
=110	4(1)				
Maternal height (Cm)					
<160	80(20.0)				
160 – 165	120(30.0)	165±0.01	150	178	28
166 – 170	140(35.0)				
=171	60(15.0)				
Mean arterial pressure (mmHg)					
=70	144(36.0)				
71 – 100	235(58.8)	71.24±19.2	33.3	123.3	90
=101	21(5.2)				
Age (years)					
=20	36 (9.0)				
21 – 30	200 (50.0)	29.3±5.8	17	44	270
31 -40	158 (39.5)				
=41	6 (1.5)				

Table III: Maternal predictors and mode of delivery 2

Marital status	Mode of delivery				
	SVD	**CS**	**Total**	**Chi square test**	**P value**
Not partnered	105	12	117		
Partnered	207	76	283	13.3	0.000
Total	312	88	400		
Occupation					
Unemployed	110	16	126		
Employed	202	72	274	9.3	0.0023
Total	312	88	400		

Table IV: Maternal predictors and mode of delivery 3

Variable	Pearson corr.	Sig. level	T test	P value	95% CI Lower	Upper
Age	0.168	0.000	2.58	0.010	0.002	0.017
Map	0.161	0.001	2.67	0.008	0.001	0.006
Weight	0.117	0.010	1.30	0.194	-0.001	0.005
Height	-0.088	0.039	-1.512	0.131	-1.107	0.145

Table V: Maternal predictors and mode of delivery 4

Variables	Mode of delivery		T test	P. value	Pearsons corr.	95% CI	
	VD	CS				Lower	Upper
Age(years)							
<20	17.67±1.03	19.67±0.516	-3.873	0.012	0.250	-3.327	-0.673
21 – 30	22.87±1.61	27.00±2.85	-9.101	0.000	0.495	-5.062	-3.204
>31	33.83±2.08	34.67±3.65	-1.805	0.077	0.489	-1.762	0.095
MAP (mmHg)							
<71	36.17±1.11	61.01±14.72	-8.672	0.000	0.639	-30.76	-18.92
71 – 100	74.71±2.18	80.07±8.85	-4.481	0.000	0.299	-7.77	-2.96
>100	101.68±13.33	103.65±15.68	-0.375	0.715	0.223	-13.51	9.58
Weight(Kg)							
<65	60.25±4.69	60.33±6.19	-0.076	0.94	0.548	-2.34	2.17
65 – 94	72.11±3.15	82.93±7.23	-12.69	0.00	0.506	-12.52	-9.11
>95	100.75±3.22	106.0±5.56	-3.99	0.00	0.573	-8.14	-2.36
Height(CM)							
<160	154.0±2.52	154.50±3.21	-0.589	0.562	0.038	-2.26	1.26
161 - 170	163.40±2.37	164.80±3.40	-1.67	0.111	0.193	-3.15	0.35
>171	170.38±1.06	170.50±0.53	-0.357	0.732	0.378	- 0.95	0.70

Table III: Maternal predictors and mode of delivery 2

Women who were either married or cohabiting constituted 283 (70.8%) of the study population with 126 (31.5%) of the women unemployed

Table IV: Maternal predictions and mode of delivery 3

Maternal age and MAP had significant positive correlation with MOD, with both variables showing significant statistical association with MOD when other maternal confounders were controlled. Maternal height revealed a significant negative correlation with MOD.

Table V: Maternal predictions and mode of delivery

Women within the age group <20 years and 21-30 years showed significant statistical association with CS as MOD while participants with MAP of <71mmHg and 71-100 mmHg showed significant statistical association with CS as MOD.

Discussion

The MOD of new born by a pregnant mother have been found to be significantly associated with maternal variables such as MAP, age, marital and employment status. Scholarly articles have identified benefits of CS such as reduction in maternal and perinatal morbidity and mortality.[28] In contrast, some authors have enumerated deleterious effects of CS on mother and child.[2]

The overall prevalence of CS in this study was 22.0%. This came close to the national prevalence of 26.3% in Guatemala.[22] This also differs from prevalence of 66.3% and 42.5% recorded in Beijing and southwest Nigeria respectively.[20,30] However, this prevalence was above the WHO recommended prevalence of 10 to 15%.[9] The comparative low prevalence of CS recorded in this study would have been due to inadequate access to service.[11] This is in light of the fact that the study area is a rural island and have limited health facilities with even limited number of health care workers with skills to carry out the procedure. It was shown that the rate of CS in urban area are higher than in rural communities.[31] Furthermore, 31.5% of study population were unemployed, this figure is well above the national unemployment rate of 27.10% as recorded in the second quarter 2020 report of the national bureau of statistics in Nigeria.[32] Subsequently, this is also above the international labour organization accepted unemployment rate of 8.3%. Considering that CS is costly[13] and usually prevalent among people that are financially stable,[31] most residents in need of this service may not be able to access this

service due to inadequate service and paltry financial power.

Results from this study revealed a statistically significant association between CS and MAP. The prevalence of hypertension among study population in this research was 12.0% with 41.6% rate of CS among pregnant women with high blood pressure. This was similar to prevalence of 12.2% for chronic hypertension and contrasted with 60.2% CS rate among hypertensive recorded in a study.[17] Remarkably some studies have recorded prevalence of hypertension in pregnancy low as 10% and 5% respectively.[17,33] In contrast to the prevalence recorded in this study, some studies have recorded prevalence high as 53.5% and 60.2% respectively.[17,31] In addition, some studies have revealed low prevalence of CS among pregnant hypertensives as 2.9% and 4.4% respectively.[16] What is obvious in these studies is the fact that hypertension is the most common medical condition in pregnancy.[34] Caesarean section rates among pregnant hypertensives have continued to increase.[4,5] Results from this study showed significant association between CS and MAP after controlling for other maternal confounders using multivariate logistic regression analysis (MVLR). However, univariate logistic regression analysis done on MAP reveals that study population with MAP above 100mmHg showed no statistically significant association with CS. interestingly, results also revealed a strong significant positive Pearson correlation between MAP and CS. The results obtained in this study were also in concordance with results from other studies.[16,17,35] Contrastingly some studies did not significantly associate Gestational hypertension with CS,[15] while a few showed no significant association between chronic hypertension and emergency CS.[25] The mechanism which predisposes pregnant women with hypertension to CS could be attributed to foetal stress which may result from foetal growth restriction due to reduction in villous volume and surface area for maternal-foetal exchange.[51] However, this study did not distinguish association between CS and various forms of hypertension during pregnancy.[14-17] This was largely due to inadequate data, and further research in this area will be encouraged.

This study recorded a significant association between maternal age and CS as MOD, with significant positive correlation even after controlling for other confounding variables. The mean age at delivery in this study was 29.3±5.8 years with minimum and maximum age at 17 and 44 years respectively. This was similar to mean age in a study conducted in Ethiopia and Italy in 2009 with mean age at delivery at 28.7 and 31.8 years respectively.[36,39] However, this figure contrasted with mean age at delivery of 25.2 years in an Italian study conducted in 1981.[37] This reveals a gradual increase in mean age at delivery. The reason for the disparity in mean age at delivery and rising rate of delivery age could be attributed to socio economic and cultural factors and also age at first marriage for women.[40] Further evidence to support above claim was seen in USA with a 61% drop in teen birth.[41] There was a strong statistically significant association between CS and maternal age <20years and 21-30 years respectively, but no significant association between CS and maternal age> 30years. The result in this study was in congruence with results obtained in other studies which supports CS with increasing maternal age.[18,19] It has been documented that both extremes of age may be complicated with perinatal consequences with advanced maternal age complicated with CS.[36] It was reported that reduced number of oxytocin receptors in the uterine myometrium would have been the reason why surgeons opt for CS rather than vaginal delivery.[36] It is worthy to note that, the study population had few women of advanced maternal age and the low study size in this age grade would have been responsible for the insignificant association between CS and maternal age >30 years. It is anyway, remarkable that odds for CS was larger than that for vaginal delivery for this age grade. It is anticipated that a community with larger number of women in advanced maternal age will show significant association between CS and maternal age > 30 years.

Employment status was revealed to have statistically significant association with CS in this survey. About 68.5% of all participants were employed while 22.0% of all participants and 26.3% of employed participants had CS. Results from this study was in congruence with results from similar studies which showed a statistically significant association between employment status and CS.[42-44]

In contrast, some studies showed no significant association between CS and employment status.[45] It is imperative to mention that CS is costly[13] and usually prevalent among richer women.[31] Also, some women opt for CS as MOD without any medical indication.[46] All these facts gravitate to availability of finance. Therefore, unemployed and women with lean finance may not seek CS as first option for delivery. This could be the reason responsible for the association between CS and employment status.

Findings in this study also revealed a significant association between CS and marital status. This observation was also corroborated by other studies.[49,50] In contrast, some studies did not concur with the findings obtained in this survey.[47,48] However, it is anticipated that the combined resources of married couple will enhance their ability to access CS readily when need arises than single and unmarried women. Also, men place more premium on women who are legitimately married to them than those who are not, and will readily contribute their finances to solve any medical condition that may arise.

Furthermore, other maternal variables such as height and weight were not significantly associated with CS as MOD. Remarkably some scholarly papers find significant association between these maternal variables such as weight and height with CS as MOD.[18,21,23,24]

Generally, it is important to institute appropriate surveillance mechanism especially during ANC to ensure the control of these variable such as MAP and to use these variables as predicators where they occur to make preparation for possible CS in event that control measures fail.

Conclusion

Maternal variables such as age, MAP, marital and employment status have been found to be significantly associated with CS as a MOD. These factors could be used as indicators for surveillance during ANC and possibly predicting MOD for pregnant women.

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