

Analysis of Caesarean Delivery in General Hospitals in Sokoto State Using Robson's Ten Classification: A Cross-Sectional Study

Jennifer Adaeze Chukwu^{1*}, Chinedu O. Egwu², Chidinma Chukwu³, Doris Atibinye Dotimi⁴

¹*Project Management Unit/Project Manager, World Health Organization, United Nations House Plot 617/618 Central Area District PMB 2861 Abuja, Nigeria*

²*Medical Biochemistry Department/Lecturer, College of Medicine, Alex-Ekwueme Federal University Ndufu-Alike, P.M.B. 1010 Ebonyi State, Nigeria*

³*Deputy Manager/Clinic Lead, 370 Wilsthorpe Road, Alexandra Nursing Home, long Eaton, Nottingham. NG10 4AA*

⁴*Public Health Department/Lecturer, Bayelsa Medical University, 27 Imgbi Road, Yenegoa, Bayelsa Nigeria*

Abstract

Maternal mortality is relatively higher in the northern part of Nigeria. The level of caesarean section (CS) performed in a facility in a locality is an important indicator of access to, and quality of maternal health services in that locality. The Robson classification has been recommended by the World Health Organization as a gold standard for assessing, monitoring, and comparing CS rates at all levels. This was a cross-sectional study across six primary health facilities (General hospitals (GHs) spread across six local government areas in Sokoto state, Northwest Nigeria. Data were collected from medical charts of all women who attended antenatal care/delivered from August - November 2022. The overall CS was calculated, and the women categorized into one of the ten Robson groups. The data showed that the women with the highest frequency of delivery were aged less than 20 (44.98%) followed by those aged 20-34. The CS rate in Sokoto State GHs was 13.56%, a rate relatively higher than the average in sub-Saharan Africa. The data showed that the commonest forms of CS were those in Robson's Group 1-4, which are categorized as low risk forms of CS, where Group 4 had the highest CS cases (26.62%). Our findings can guide the State Ministry of Health in policy formulation and implementation to improve the maternal and child health in the State.

Keywords: Caesarean section, delivery, Robson Classification, Obstetrics, Sokoto Nigeria, primary healthcare.

Introduction

There is increasing maternal mortality and complications after birth in Nigeria, a scenario which is higher in Northern part of Nigeria due to the method of child delivery adopted in different health facilities [1]. Annually, at least 140 million births occur globally. For effective child delivery, maternal health, that is the health of women during pregnancy, childbirth, and the postnatal period, is of essence. Child delivery is often accompanied by several complications

which vary in severity. These complications include but not limited to non-progressive labour; perineal tears; problems with the umbilical cord; abnormal heart rate of the baby; water breaking early; perinatal asphyxia; shoulder dystocia and excessive bleeding, and some of these complications are associated with the method of child delivery [2, 3].

At least 50% maternal deaths occur in fragile and humanitarian settings, where sub-Saharan Africa (SSA) and Southern Asia shared the

Received: 09.10.2023

Accepted: 19.10.2023

Published on: 29.12.2023

*Corresponding Author: gennytimah@gmail.com

largest global burden of maternal deaths (86%) in 2017 [4]. There is a close association between poverty and perinatal health [5]. Currently, Nigeria is the most populated country in the sub-Saharan Africa and has about 63% of persons who are multi-dimensionally poor [6], which means that the burden of maternal deaths will be highest in this region. The burden of poverty is worse in the Northern part of Nigeria (where the study state, Sokoto is situated) where about 65% of the poor live [6].

According to the Nigeria ministry of health, 40,000 women die from pregnancy-related complications annually [7]. There are several causes of child delivery complications. These may include: some medical conditions like obesity, diabetes, and hypertension; intake of some drugs during pregnancy, some lifestyles; and family history of birth complications. Other causes may be the expertise of birth attendants and the method of child delivery. While some of the causes are preventable, others are not. Regular antenatal visits and expertise advice, and the use of appropriate birth method like caesarean section may reduce such complications. Most data available for the complications of childbirth are often generalistic in nature. It is therefore important to have the data from community-based studies which will be vital in policy making and program implementation to reduce birth complications. Overall, the prevalence of CS in Nigeria was nearly 2.1% in 2013; however, regional studies shows that the prevalence was highest in the South, where it could be as high as 4.7% and, lowest in the North especially in the North-East and North-West (the study site) [8]. The disparity in CS level in these regions aligns with the level of education and enlightenment in these regions. A study of the CS delivery in Sokoto will reveal the regional prevalence and will be of help in health policy formulation and implementation.

Child delivery in the Northern Nigeria is influenced by religion, prevalence of prevalence of obstetrics fistula, educational and social status [8-10]. In Northern Nigeria, the use of traditional

birth attendants (TBAs) is still very common with its accompanying challenges of birth complications [11]. Women living in rural areas are 77% more likely to give birth at home than in a health facility from the series of TBAs [12, 13]. It is therefore important to understudy and comprehend the current practice in Sokoto State in order to be able to make policies that will improve the birth outcomes. This study is therefore directed to study and analyse the caesarean delivery methods in Sokoto State General Hospitals, classifying them using the Robson classification method. The Robson classification system classifies all deliveries into ten mutually exclusive and totally inclusive groups based on a set of predefined obstetric parameters which include parity, previous CS, onset of labour, foetal presentation, number of foetuses and gestational age [14].

Materials and Methods

Study Design, Setting, and Participants

This was a cross-sectional study conducted in six (6) out of the 19 General Hospitals (GHs) in Sokoto State Nigeria. These GHs are primary health centres that have ty conducting close to 3075 deliveries per annum. Even these facilities are primary health centres, referrals are to them by other hospitals. The study population included all women who went to the hospitals for antenatal care (ANC)/labour and delivery related matters from August to November 2022. Stratified and Random sampling techniques were applied to collate the data about delivery in the said period. Firstly, stratified sampling was used to stratify Sokoto State into three strata (senatorial districts). Secondly, simple random sampling technique was used to select two GH from each stratum.

The data from women who visit the GHs from August 2022 to November 2022 was systematically collated focusing on predetermined parameters as detailed above. The chosen six GHs, spread across the three senatorial districts of the State captured

representative number of pregnancies attended to in the State (93,500/260,000).

Data Collection and Analysis

Data was collected from medical charts of all women who delivered from August 2022 to November 2022. The data was collected using semi-structured proforma. The choice of semi-structured pro-forma was to make for easy retrieval of robust information to answer the research questions.

The data was analysed using both descriptive and inferential statistics. The use of descriptive statistics in data analysis was due to its appropriateness in finding out the basic features of the study data to capture the qualitative data while the inferential statistics was useful for the quantitative data.

The overall CS rate was calculated then women categorized into one of the ten Robson groups. Relative size of each group, contribution of each group to the overall CS rate, and CS rate within each group were also calculated. The graphs and the inferential analysis were done using Graphpad prism using 95% as the confidence interval.

Results

Demographics of Participants

Over the three-month period, a total of 93,500 women presented for labour and delivery in the selected six general hospitals in Sokoto State based on the selection criteria. These The median age of participants was 27 years. The age group with the highest frequency of delivery was those less than 20 (Table 1). The rate of CS was 13.56% in Sokoto state. From the facilities studied, Tambuwal (Facility 3) had the highest occurrence 17.4% while Binji (Facility 2) had the lowest 6.9% rate of CS. During the period of study, the total hospital attendance was 39,605, out of which, 1025 delivery cases were recorded representing 2.59% of the attendance. The study which was performed in the northern part of Nigeria comprised mainly women who practice Islam as their faith (>90%). Investigation of the impact of religion on the choice of method of delivery was not done as it is beyond the scope of this work; however, future investigations may focus on this too.

Table 1. Demographics of Participants

Characteristics	Frequency (n)	Percentage (%)
Age (years)		
< 20	461	44.98
20–34	410	40.00
≥ 35	154	15.02
Total	1025	
Mode of delivery		
Vaginal delivery	886	86.44
CS	139	13.56
Total deliveries in all facilities	1025	

Robson Classification of Births in Sokoto State

The Robson classification of the deliveries across the six health facilities in Sokoto State is as presented in Tables 2-7 while the Robson classification is the entire (composite) health

facility in the Sokoto State in Table 8. For each facility, the following were calculated: Relative Group size to overall facility population (%); CS rate in each group (%); Absolute group contribution to overall CS rate (%) and Relative group contribution of each of the 10 groups to

overall CS rate (%) as presented in the tables below.

Facility 1 (Gada) has the highest number of previous CS deliveries, 48% (n=145) (Table 2). At facility 1 (Gada), Groups 3 and 4 are equally the most dominant CS (19.23%) according to the Robson classification while Groups 7 and 8 had the least prevalence (0%). In this facility, majority of the women deliver in Group 3 (60.48%).

For Facility 2 (Binji) there were no previous CS deliveries in their records (Table 3). At Binji facility, Group 3 has the highest number of CS (55.56%) according to the Robson classification while Group 1 had the least prevalence (44%). In this facility, majority of the women deliver in Group 3 (38.46%).

In facility 3 (Tambuwal) (Table 4), there were only 10 previous cases of CS deliveries. At facility 3 (Tambuwal), Groups 1, 2 and 3 were equally the most dominant CS (19.51%) according to the Robson classification while Groups 7 and 8 had the least prevalence (0%). In this facility, majority of the women deliver in Group 3 (37.97%).

For facility 4 (Bodinga) (Table 5), there were 70 previous CS cases. At this facility, Group 4 had the highest CS cases (36.84%) while groups 5-9 had zero case of CS. In this facility, majority of the women deliver in Group 3 (48.76%).

For facility 5 (Gwadabawa) (Table 6), there was only 1 (one) case of previous CS. At this facility, Group 4 had the highest CS cases (70%) while groups 1, 3, 5, 6, 7 and 9 had zero case of CS. In this facility, majority of the women deliver in Group 1 (36.47%).

For facility 6 (Goronyo) (Table 7), there were 76 cases of previous CS. At this facility, Group 4 had the highest CS cases (25%) while groups 5, 6, and 7 had zero case of CS. In this facility, majority of the women deliver in Group 1 (31.50%).

For all the facilities studied, there was a total of 302 cases of previous CS (Table 8). At these facilities, Group 4 had the highest CS cases (26.62%) while group 7 had zero case of CS. In these facilities, majority of the women deliver in Group 3 (39.71%).

Table 2. Robson Classification in Facility 1 (Gada)

Group	Total number of women with Previous CS	Total number of CS in each group	Total Number of women delivered in each group	Relative group size to overall facility population. (%) ^a	CS rate in each group. (%) ^b	Absolute group contribution to overall CS rate. (%) ^c	Relative contribution of each of the 10 groups to overall CS rate. (%) ^d
1	35	4	45	26.95	8.89	2.40	15.38
2	7	1	6	3.59	16.67	0.60	3.85
3	80	5	101	60.48	4.95	2.99	19.23
4	10	5	5	2.99	100.00	2.99	19.23
5	1	0	1	0.60	0.00	0.00	0.00
6	0	0	4	2.40	0.00	0.00	0.00
7	0	0	0	0.00	0.00	0.00	0.00
8	2	0	6	3.59	0.00	0.00	0.00
9	6	0	6	3.59	0.00	0.00	0.00
10	4	1	3	1.80	33.33	0.60	3.85
Total	145	26	167	100.00	15.57	15.57	100.00

^aRelative Group size to overall facility population (%) = n of women in the group/total N women delivered in the hospital × 100; ^bCS rate in each group (%) = n of CS in the group/total N of women in the group × 100; ^cAbsolute group contribution to overall CS rate (%) = n of CS in the group/total N of women delivered in the hospital × 100; ^dRelative group contribution of each of the 10 groups to overall CS rate (%) = n of CS in the group/total N of CS in the hospital × 100

Table 3. Robson Classification Facility 2 (Binji)

Group	Total number of women with Previous CS	Total number of CS in each group	Total Number of women delivered in each group	Relative group size to overall facility population. (%)	CS rate in each group. (%)	Absolute group contribution to overall CS rate. (%)	Relative contribution of each of the 10 groups to overall CS rate. (%)
1	0	4	46	35.38	8.70	3.08	44.44
2	0	0	8	6.15	0.00	0.00	0.00
3	0	5	50	38.46	10.00	3.85	55.56
4	0	0	6	4.62	0.00	0.00	0.00
5	0	0	2	1.54	0.00	0.00	0.00

6	0	0	4	3.08	0.00	0.00	0.00
7	0	0	2	1.54	0.00	0.00	0.00
8	0	0	6	4.62	0.00	0.00	0.00
9	0	0	2	1.54	0.00	0.00	0.00
10	0	0	4	3.08	0.00	0.00	0.00
Total	0	9	130	100.00	6.92	6.92	100.00

^aRelative Group size to overall facility population (%) = n of women in the group/total N women delivered in the hospital \times 100; ^bCS rate in each group (%) = n of CS in the group/total N of women in the group \times 100; ^cAbsolute group contribution to overall CS rate (%) = n of CS in the group/total N of women delivered in the hospital \times 100; ^dRelative group contribution of each of the 10 groups to overall CS rate (%) = n of CS in the group/total N of CS in the hospital \times 100

Table 4. Robson Classification Facility 3 (Tambuwal)

Group	Total number of women with Previous CS	Total number of CS in each group	Total Number of women delivered in each group	Relative group size to overall facility population. (%)	CS rate in each group. (%)	Absolute group contribution to overall CS rate. (%)	Relative contribution of each of the 10 groups to overall CS rate. (%)
1	0	8	32	13.50	25.00	3.38	19.51
2	0	8	14	5.91	57.14	3.38	19.51
3	4	8	90	37.97	8.89	3.38	19.51
4	0	5	24	10.13	20.83	2.11	12.20
5	3	2	21	8.86	9.52	0.84	4.88
6	1	3	11	4.64	27.27	1.27	7.32
7	1	0	13	5.49	0.00	0.00	0.00
8	0	0	7	2.95	0.00	0.00	0.00
9	1	6	7	2.95	85.71	2.53	14.63
10	0	1	13	5.49	7.69	0.42	2.44
Total	10	41	237	100.00	17.30	17.30	100.00

^aRelative Group size to overall facility population (%) = n of women in the group/total N women delivered in the hospital \times 100; ^bCS rate in each group (%) = n of CS in the group/total N of women in the group \times 100; ^cAbsolute group contribution to overall CS rate (%) = n of CS in the group/total N of women delivered in the hospital \times 100; ^dRelative group contribution of each of the 10 groups to overall CS rate (%) = n of CS in the group/total N of CS in the hospital \times 100

Table 5. Robson Classification Facility 4 (Bodinga)

Group	Total number of women with Previous CS	Total number of CS in each group	Total Number of women delivered in each group	Relative group size to overall facility population (%)	CS rate in each group. (%)	Absolute group contribution to overall CS rate. (%)	Relative contribution of each of the 10 groups to overall CS rate. (%)
1	15	1	34	28.10	2.94	0.83	5.26
2	5	1	8	6.61	12.50	0.83	5.26
3	35	3	59	48.76	5.08	2.48	15.79
4	9	7	11	9.09	63.64	5.79	36.84
5	1	0	1	0.83	0.00	0.00	0.00
6	0	0	4	3.31	0.00	0.00	0.00
7	0	0	0	0.00	0.00	0.00	0.00
8	0	0	5	4.13	0.00	0.00	0.00
9	2	0	2	1.65	0.00	0.00	0.00
10	3	1	3	2.48	33.33	0.83	5.26
Total	70	19	121	100.00	15.70	15.70	100.00

^aRelative Group size to overall facility population (%) = n of women in the group/total N women delivered in the hospital × 100; ^bCS rate in each group (%) = n of CS in the group/total N of women in the group × 100; ^cAbsolute group contribution to overall CS rate (%) = n of CS in the group/total N of women delivered in the hospital × 100;

^dRelative group contribution of each of the 10 groups to overall CS rate (%) = n of CS in the group/total N of CS in the hospital × 100

Table 6. Robson Classification Facility 5 (Gwadabawa)

Group	Total number of women with Previous CS	Total number of CS in each group	Total Number of women delivered in each group	Relative group size to overall facility population. (%)	CS rate in each group. (%)	Absolute group contribution to overall CS rate. (%)	Relative contribution of each of the 10 groups to overall CS rate. (%)
1	0	0	62	36.47	0	0	0
2	0	2	8	4.71	25	1.18	10
3	0	0	58	34.12	0	0	0
4	0	14	26	15.29	53.85	8.24	70
5	0	0	0	0	0	0	0

6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	1	3	12	7.06	25	1.76	15			
9	0	1	1	0.59	100	0.59	5			
10	0	0	3	1.76	0	0	0			
Total	1	20	170	100	11.76	11.76	100			

^aRelative Group size to overall facility population (%) = n of women in the group/total N women delivered in the hospital × 100; ^bCS rate in each group (%) = n of CS in the group/total N of women in the group × 100; ^cAbsolute group contribution to overall CS rate (%) = n of CS in the group/total N of women delivered in the hospital × 100; ^dRelative group contribution of each of the 10 groups to overall CS rate (%) = n of CS in the group/total N of CS in the hospital × 100

Table 7. Robson Classification Facility 6 (Goronyo)

Group	Total number of women with Previous CS	Total number of CS in each group	Total Number of women delivered in each group	Relative group size to overall facility population. (%)	CS rate in each group. (%)	Absolute group contribution to overall CS rate. (%)	Relative contribution of each of the 10 groups to overall CS rate. (%)
1	20	4	63	31.5	6.35	2.00	16.67
2	2	2	14	7	14.29	1.00	8.33
3	1	3	49	24.5	6.12	1.50	12.50
4	45	6	55	27.5	10.91	3.00	25.00
5	0	0	1	0.5	0.00	0.00	0.00
6	0	0	2	1	0.00	0.00	0.00
7	0	0	1	0.5	0.00	0.00	0.00
8	3	3	11	5.5	27.27	1.50	12.50
9	4	5	2	1	250.00	2.50	20.83
10	1	1	2	1	50.00	0.50	4.17
Total	76	24	200	100	12.00	12.00	100.00

^aRelative Group size to overall facility population (%) = n of women in the group/total N women delivered in the hospital × 100; ^bCS rate in each group (%) = n of CS in the group/total N of women in the group × 100; ^cAbsolute group contribution to overall CS rate (%) = n of CS in the group/total N of women delivered in the hospital × 100; ^dRelative group contribution of each of the 10 groups to overall CS rate (%) = n of CS in the group/total N of CS in the hospital × 100

Table 8. Robson Classification in Six- Health Facilities in Sokoto State

Group	Total number of women with Previous CS	Total number of CS in each group	Total Number of women delivered in each group	Relative group size to overall facility population. (%)	CS rate in each group. (%)	Absolute group contribution to overall CS rate. (%)	Relative contribution of each of the 10 groups to overall CS rate. (%)
1	70	21	282	27.51	7.45	2.05	15.11
2	14	14	58	5.66	24.14	1.37	10.07
3	120	24	407	39.71	5.90	2.34	17.27
4	64	37	127	12.39	29.13	3.61	26.62
5	5	2	26	2.54	7.69	0.20	1.44
6	1	3	25	2.44	12.00	0.29	2.16
7	1	0	16	1.56	0.00	0.00	0.00
8	6	6	47	4.59	12.77	0.59	4.32
9	13	12	20	1.95	60.00	1.17	8.63
10	8	4	28	2.73	14.29	0.39	2.88
Total	302	139	1025	100.00	13.56	13.56	100.00

^aRelative Group size to overall facility population (%) = n of women in the group/total N women delivered in the hospital × 100; ^bCS rate in each group (%) = n of CS in the group/total N of women in the group × 100; ^cAbsolute group contribution to overall CS rate (%) = n of CS in the group/total N of women delivered in the hospital × 100;

^dRelative group contribution of each of the 10 groups to overall CS rate (%) = n of CS in the group/total N of CS in the hospital × 100

Discussion

Caesarean section is a very important intervention to decrease maternal and neonatal morbidity and mortality and has been used as one of the best indicators of the quality of maternal health services [15]. For effective intervention, it is pertinent to appropriately classify the types of deliveries that occur in each facility or representative facilities in regions. This will give room for proper policy making and implementation of individualized approaches in maternal and child health.

Thus, to optimize outcomes, facilities should initiate a detailed and rigorous assessment of their practice vis-à-vis the case mix of obstetric population they serve. The Robson ten group classification system enables institution-specific monitoring and auditing and can be a powerful tool to inform practice across different settings [16, 17]. The use of Robson classification is new in Nigeria and this study is among the first to deploy it for the classification of deliveries in Northern Nigeria in 2022.

In this study, the overall average CS rate in the six Sokoto State General hospitals was 13.56% (Table 8). This is higher than the rate in earlier studies in Nigeria which put the national average to 2.1% (lower in the North) [8]. The use of CS as a method of delivery has continued to rise from across different countries and continents, cutting across high-income, middle-income, and low-income countries [18]. The CS rate reported in Sokoto State general hospitals is higher than the average CS rates in Africa and the sub-Saharan Africa subregion which are less than 10% respectively. This remarkable improvement in the CS rate may be attributed to so many factors which may include but not limited to increased awareness, incentivised hospital delivery, free/subsidized maternal care in northern Nigeria [19].

At each facility, the rates were Tambuwal-17.30% (Table 4), Bodinga-15.70% (Table 5), Gada-15.57% (Table 2), Gwadabawa-11.76% (Table 6), Goronyo-12.00% (Table 7) and Binji-

6.92% (Table 3). All the rates at this facility including the lowest in Binji-6.92% are higher than the average in sub-Saharan African subregion of 5% [18]. Even though the rates across all the facilities were higher than that of the average in sub-Saharan African region, the majority of the hospital visits for labour and delivery are in Groups 1 to 4, the groups known to have lower CS risks [20].

Demographics- Child Delivery Age

Age is a very important predictor of CS globally. Recently, most women are increasingly becoming career minded. This increases the age at which they go into marriage and also the age of childbearing. Increase in age often comes with increase in educational, social status and deteriorating health conditions [21]. This increases the chances of birth via CS. However, in the northern part of Nigeria, the level of education and social status is generally lower compared to the men and even women from other parts of the country. This partly explains the general young average child-bearing age in the north as corroborated by our current study which shows that majority of the women that took to CS were mostly less than 20 years (44.98%).

More so, in Muslim communities, there is no minimum age for girlchild marriage. The age is usually pegged at psychological maturity of the girlchild which could be a little above the puberty age. This explains partly why the percentage of those presenting for labour and delivery is highest for women less than 20 years. As of 2018 in Nigeria, the mean age of first pregnancy is 22.5. Even though this represents an increase in age of first pregnancy from the 21.4 years in 2003, the mean age in the Northwest region of Nigeria (study site) is approximately 20 [22], which is in tandem with our reports. In a related study by Bolarinwa et al., a high proportion of adolescent pregnancy was located in the Northern parts of Nigeria which were linked to educational status among other factors [23].

Robson Classification of Births in Sokoto State

In this study, we implemented the Robson classification and assessed the proportion of each group in the obstetric population, their age brackets, the contribution of CS in each group to the overall CS rate and the CS rate within each group. We considered 6 health facilities out of the nineteen (19) health facilities (General hospitals) in Sokoto State, representing over 31% of the health facilities in the State. The chosen health facilities saw about 17% (6543/39605) of the total cases of hospital attendance in state-owned hospital facilities in Sokoto State between August to November 2022.

In our study, Groups 1 and Group 3 represented the two largest groups presenting for labour and delivery, 27.51 and 39.71% respectively (Table 8). This finding is in tandem with previous finding in studies done in facilities in India and Ethiopia [14, 24]. In a similar manner, studies done in Italy, Tanzania and Brazil pointed out that groups 1 and 3 presented more for labour and delivery in their respective facilities [25-27]. The persistent high levels of presentation for labour and delivery in Groups 1 and 3 across different facilities in different countries and continents can be explained in part by the fact such regions are known for more spontaneous deliveries than planned CS and these Groups also have lower risks [20]. In contrast, a study done at Nishtar Medical University Hospital, Multan Pakistan using Robson classification showed that Group 10 accounted for over 50% of the cases presenting for labour and delivery while Group 1 was the 3rd on the list at the facility [28]. Contrastingly too in another study done in the Southwestern part of Nigeria, Group 5 had the largest number of women for labour and delivery cases (34.5%) followed by Group 2 (14.0%), 10 (12.6%) and 3 (10.0%) respectively [29]. These variations can be explained by the significant difference in the obstetric population served by the different facilities. In another study in North Central

Nigeria, the findings were similar to the one in Southwest Nigeria where groups 5, 1 and 3 were the top three contributors to labour and delivery cases in that facility [30]. While the studies in the Southwestern (Ogun State) and North Central (Benue State) part of Nigeria had predominantly Christian and highly educated population, our current study was done in the North-west region where majority of the women are Muslims with lower educational status.

Group 4 was found to be the distant third-largest obstetric group 12.39%. In this group, the in-group percentage of CS was 29.13% which was second to the highest in-group CS rate seen in Group 9 (Table 8).

Group 7 was seen to have the lowest cases for labour and deliveries with 1.56%. as a matter of fact, this group had zero percentage of CS. Therefore, there was no case of multiparous women with a single breech pregnancy including those with previous uterine scars.

In our study, there was a total of 302 cases of previous CS representing 29.46% of the total women presenting at the facility for labour and deliveries. The number of previous CS represents the total number of times all the women visiting the facilities had had CS. Some of the women had multiple previous CS, the reason for the high percentage of previous CS.

In this study, majority of the women presenting for labour and deliveries were highest in the groups 1 to 4 (85.27%) which are considered as the low-risk groups [20]. Groups from 1 to 4 do not require CS procedures because they are considered as low-risk groups, indicating that Sokoto State General hospitals have a high CS delivery rate in low-risk patients.

Conclusion

In this study, the rate of CS in Sokoto General hospitals was 13.56%, which is above the average in Africa and the sub-Saharan African region. This is quite informative as this can guide in making relevant health policies which would not have been properly captured by the overall African average. It is therefore imperative to

have a facility-based study of the methods of deliveries to avoid errors from generalisation in policy making and implementation. Since Sokoto is a Northwestern State, we recommend a repeat of the study protocol in another Northwestern State and other States in the North to really capture the CS prevalence in the Northern region of Nigeria.

Limitations of Study

The study only covered six general hospitals in Sokoto State, Northwest Nigeria. The study should capture more facilities including private practices to capture the true picture of CS in the State. More so, this study only focused on one region in the Northern part of Nigeria. The conclusion may be skewed towards a particular.

References

- [1] Meh, C.; Thind, A.; Ryan, B.; Terry, A. Levels and Determinants of Maternal Mortality in Northern and Southern Nigeria. *BMC Pregnancy Childbirth* 2019, 19, 1–13, doi:10.1186/S12884-019-2471-8/TABLES/3.
- [2] Thompson, J.F.; Roberts, C.L.; Currie, M.; Ellwood, D.A. Prevalence and Persistence of Health Problems after Childbirth: Associations with Parity and Method of Birth. *Birth* 2002, 29, 83–94, doi:10.1046/J.1523-536X.2002.00167. X.
- [3] Office of Communications NIH What Are Some Common Complications during Labor and Delivery? | NICHD - Eunice Kennedy Shriver National Institute of Child Health and Human Development Available online: <https://www.nichd.nih.gov/health/topics/labor-delivery/topicinfo/complications#> (accessed on 22 January 2023).
- [4] WHO Maternal Health - GLOBAL Available online: https://www.who.int/health-topics/maternal-health#tab=tab_2 (accessed on 20 January 2023).
- [5] Hamad, R.; Rehkopf, D.H. Poverty, Pregnancy, and Birth Outcomes: A Study of the Earned Income Tax Credit. *Paediatr. Perinat. Epidemiol.* 2015, 29, 444, doi:10.1111/PPE.12211.

Ethical Considerations

Before the commencement of the study, an ethical approval was applied for and obtained from the Sokoto State Ministry of Health (Ref no: SKHRE/053/2023). The study was conducted in line with guidelines of public health research- autonomy, beneficence, non-maleficence, and justice.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgements

The authors wish to acknowledge the hospital management boards of the centres used for the study for allowing us to use their respective facilities.

[6] National Bureau of Statistics Nigeria Launches Its Most Extensive National Measure of Multidimensional Poverty Available online: <https://nigerianstat.gov.ng/news/78> (accessed on 22 January 2023).

[7] DailyTimes 40,000 Women Die from Pregnancy-Related Complications Yearly in Nigeria - Official Available online: <https://www.premiumtimesng.com/news/headlines/516133-40000-women-die-from-pregnancy-related-complications-yearly-in-nigeria-official.html> (accessed on 22 January 2023).

[8] Adewuyi, E.O.; Auta, A.; Khanal, V.; Tapshak, S.J.; Zhao, Y. Cesarean Delivery in Nigeria: Prevalence and Associated Factors—a Population-Based Cross-Sectional Study. *BMJ Open* 2019, 9, doi:10.1136/BMJOPEN-2018-027273.

[9] Ngongo, C.J.; Raassen, T.J.I.P.; Mahendeka, M.; Lombard, L.; van Roosmalen, J. Iatrogenic Genito-Urinary Fistula Following Cesarean Birth in Nine Sub-Saharan African Countries: A Retrospective Review. *BMC Pregnancy Childbirth* 2022, 22, doi:10.1186/S12884-022-04774-0.

[10] Maddah, G.; Fattahi, A.S.; Rahnama, A.; Jamshidi, S.T. Uterocutaneous Fistula Following Cesarean Section: Successful Management of a Case - *PMC.* 2016, 41, 157–160.

- [11] Amutah-Onukagha, N.; Rodriguez, M.; Opara, MPH, I.; Gardner, M.; Assan, M.A.; Hammond, R.; Plata, J.; Pierre, K.; Farag, E. Progresses and Challenges of Utilizing Traditional Birth Attendants in Maternal and Child Health in Nigeria. *Int. J. MCH AIDS* 2017, 6, 130, doi:10.21106/IJMA.216.
- [12] United Nations Development Programme Nigeria MDGs End-Point Report 2015 | United Nations Development Programme Available online: <https://www.undp.org/nigeria/publications/nigeria-mdgs-end-point-report-2015> (accessed on 22 January 2023).
- [13] Iwu, C.A.; Uwakwe, K.; Oluoha, U.; Duru, C.; Nwaigbo, E. Empowering Traditional Birth Attendants as Agents of Maternal and Neonatal Immunization Uptake in Nigeria: A Repeated Measures Design. *BMC Public Health* 2021, 21, 1–8, doi:10.1186/S12889-021-10311-Z/FIGURES/3.
- [14] Abubeker, F.A.; Gashawbeza, B.; Gebre, T.M.; Wondafrash, M.; Teklu, A.M.; Degu, D.; Bekele, D. Analysis of Cesarean Section Rates Using Robson Ten Group Classification System in a Tertiary Teaching Hospital, Addis Ababa, Ethiopia: A Cross-Sectional Study. *BMC Pregnancy Childbirth* 2020, 20, 1–7, doi:10.1186/S12884-020-03474-X/TABLES/3.
- [15] WHO; UNFPA; UNICEF; AMDD Monitoring Emergency Obstetric Care: A Handbook Available online: <https://apps.who.int/iris/handle/10665/44121> (accessed on 20 January 2023).
- [16] Robson, M.; Hartigan, L.; Murphy, M. Methods of Achieving and Maintaining an Appropriate Cesarean Section Rate. *Best Pract. Res. Clin. Obstet. Gynaecol.* 2013, 27, 297–308, doi:10.1016/J.BPOBGYN.2012.09.004.
- [17] WHO WHO Statement on Cesarean Section Rates. *Reprod. Health Matters* 2015, 23, 149–150, doi:10.1016/J.RHM.2015.07.007.
- [18] Betran, A.P.; Ye, J.; Moller, A.B.; Souza, J.P.; Zhang, J. Trends and Projections of Cesarean Section Rates: Global and Regional Estimates. *BMJ Glob. Heal.* 2021, 6, doi:10.1136/BMJGH-2021-005671.
- [19] Okoli, U.; Morris, L.; Oshin, A.; Pate, M.A.; Aigbe, C.; Muhammad, A. Conditional Cash Transfer Schemes in Nigeria: Potential Gains for Maternal and Child Health Service Uptake in a National Pilot Programme. *BMC Pregnancy Childbirth* 2014, 14, 1–13, doi:10.1186/S12884-014-0408-9/TABLES/4.
- [20] Alsulami, S.M.; Ashmawi, M.T.; Jarwan, R.O.; Malli, I.A.; Albar, S.K.; Al-Jifree, H.M. The Rates of Cesarean Section Deliveries According to Robson Classification System During the Year of 2018 Among Patients in King Abdul-Aziz Medical City, Jeddah, Saudi Arabia. *Cureus* 2020, 12, doi:10.7759/CUREUS.11529.
- [21] Bayrampour, H.; Heaman, M. Comparison of Demographic and Obstetric Characteristics of Canadian Primiparous Women of Advanced Maternal Age and Younger Age. *J. Obstet. Gynaecol. Can.* 2011, 33, 820–829, doi:10.1016/S1701-2163(16)34985-4.
- [22] Olowolafe, T.A.; Adebowale, A.S.; Fagbamigbe, A.F.; Bolarinwa, O.A.; Akinyemi, J.O. Shifts in Age Pattern, Timing of Childbearing and Trend in Fertility Level across Six Regions of Nigeria: Nigeria Demographic and Health Surveys from 2003–2018. *Plos One* 2023, 18, doi:10.1371/JOURNAL.PONE.0279365.
- [23] Bolarinwa, O.A.; Tessema, Z.T.; Frimpong, J.B.; Babalola, T.O.; Ahinkorah, B.O.; Seidu, A.A. Spatial Distribution and Factors Associated with Adolescent Pregnancy in Nigeria: A Multi-Level Analysis. *Arch. Public Heal.* 2022, 80, 1–13, doi:10.1186/S13690-022-00789-3/TABLES/2.
- [24] Sah, S.; Goel, R.; Goel, J.K. Analysis of Cesarean Section Rate According to Robson's Criteria in Tertiary Care Centre. *Int. J. Reprod. Contraception, Obstet. Gynecol.* 2018, 7, 3060–3064, doi:10.18203/2320-1770.IJRCOG20182947.
- [25] Triunfo, S.; Ferrazzani, S.; Lanzone, A.; Scambia, G. Identification of Obstetric Targets for Reducing Cesarean Section Rate Using the Robson Ten Group Classification in a Tertiary Level Hospital. *Eur. J. Obstet. Gynecol. Reprod. Biol.* 2015, 189, 91–95, doi:10.1016/J.EJOGRB.2015.03.030.
- [26] Costa, M.L.; Cecatti, J.G.; Souza, J.P.; Milanez, H.M.; Gülmezoglu, M.A. Using a Cesarean Section Classification System Based on Characteristics of the Population as a Way of Monitoring Obstetric Practice. *Reprod. Health* 2010, 7, 13, doi:10.1186/1742-4755-7-13.

[27]Litorp, H.; Kidanto, H.L.; Nystrom, L.; Darj, E.; Essén, B. Increasing Caesarean Section Rates among Low-Risk Groups: A Panel Study Classifying Deliveries According to Robson at a University Hospital in Tanzania. *BMC Pregnancy Childbirth* 2013, 13, 1–10, doi:10.1186/1471-2393-13-107/TABLES/4.

[28]Parveen, R.; Khakwani, M.; Naz, A.; Bhatti, R. Analysis of Cesarean Sections Using Robson’s Ten Group Classification System. *Pakistan J. Med. Sci.* 2021, 37, 567, doi:10.12669/PJMS.37.2.3823.

[29]Akadri, A.A.; Imaralu, J.O.; Salami, O.F.; Nwankpa, C.C.; Adepoju, A.A. Robson Classification of Caesarean Births: Implications for Reducing Caesarean Section Rate in a Private Tertiary Hospital in Nigeria. *BMC Pregnancy Childbirth* 2023, 23, 1–8, doi:10.1186/S12884-023-05557-X/TABLES/5.

[30]Ochejele, S.; Emoekpere, H.; Nkawu, M.; Alagh, M. Robson Classification of Caesarean Sections at the Federal Medical Centre, Makurdi. *Trop. J. Obstet. Gynaecol.* 2021, 38, 261–265.