

## Caesarean Section in a Referral Hospital in Sub-Saharan Africa: Frequency and Evaluation according to the Robson Classification

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### ABSTRACT

**Introduction:** The WHO recommends the Robson classification in all maternity wards in order to serve as a global and standard model to better appreciate the practice of caesarean section around the world.

**Objective:** Study the frequency, indications, the Robson groups most likely to provide caesarean sections and, maternal and perinatal complications.

**Materials and Methods:** This was a retrospective descriptive and analytical study carried out at the Douala General Hospital from January 1, 2011 to December 31, 2021. The SPSS software version 23, the odds ratio at a confidence interval of 95% and a p value <0.05 permitted data analysis.

**Results:** The frequency of caesarean sections is increasing at the Douala General Hospital. It increased from 18.41% in 2011 to 32.49% in 2021, with an average of 27.92%. The main indications for caesarean section were: fetal distress, elective caesarean sections and severe preeclampsia. Group 5 was the first provider of caesarean sections (28.50%), followed by group 10 (17.04%) and group 2 (11.78%). Belonging to groups 5, 10 and 2 significantly increased the risk of caesarean section by 10 times (OR: 10.28; 95% CI [6.90-15.32]; p = 0.001), 4 times (OR = 4.425; 95% CI [2.97-6.58]; p=0.001) and 2 times (OR=2.704; 95% CI [1.68-4.34]; p=0.001) respectively. Maternal and perinatal complications were mainly intra-operative hemorrhage (1.43%), postpartum hemorrhage (0.95%), postpartum anemia (1.43) and fetal asphyxia (7.16%); maternal and perinatal deaths (0.47% and 3.34%) were observed in groups 10, 8 and 5.

**Conclusion:** The frequency of caesarean sections is increasing at the Douala General Hospital; groups (Robson) 5, 10 and 2 are the most affected. Maternal and fetal deaths are observed in groups 10, 8 and 5.

**Keywords:** Caesarean section, Frequency, Indications, Robson classification, Complications, Douala General Hospital

### INTRODUCTION

Caesarean section (CS) is the artificial delivery of a newborn by abdominal wall surgical incision to remove a newborn from the maternal uterus [1]. While in 2015, the World Health Organization (WHO) estimated that only 10-15% of all births require a caesarean section [2], the global caesarean section rate has risen from 12% in 2000 to almost 21.1% in 2018 [3]. In Cameroon, according to the 2018 Demographic and Health Survey report, between 1991 and 2018, the percentage of births by caesarean section has slightly changed: 2.3% in 1991, 2.0% in 2004, 3.8% in 2011

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and 3.5% in 2018, with the highest frequency recorded in the city of Douala (11%) [4]. At the Douala General Hospital (DGH), between January 2000 and December 2007, Nguéack [5] found a caesarean section frequency of 13.25% with the main complications being intra and post-operative hemorrhage [5]. Controlling the caesarean section rate is a major concern in the obstetrical field given the risk of morbidity and mortality associated with this practice [6,7]. In 2017, the WHO proposed to implement the Robson classification in all maternity units and use it as a global standard to assess, monitor and compare caesarean section rates [8]. The Robson system classifies all women into 10 mutually exclusive categories that form a comprehensive set. These categories are based on five basic obstetric parameters: parity, onset of labor, gestational age, presentation and number of fetuses [9]. The Robson system criteria are widely used in developed countries, as well as in many health facilities around the world. In sub-Saharan Africa, this classification is gradually considered.

## OBJECTIVE

To assess the frequency and indications of CS, the Robson's group most likely to experience CS and, the maternal and perinatal complications.

## MATERIALS AND METHODS

This was a cross sectional study conducted at the DGH, over a 10-year period from 1 January 2011 to 31 December 2021. Women who delivered in the hospital and whose records allowed them to be classified in one of the ten groups of the Robson classification were included in this study.

Data were collected from records of the department of Mother and child, using a pre-tested data collection sheet. Sociodemographic data, obstetrical characteristics, indications of CS, mode of admission and maternal and fetal prognosis were collected. Only files collected from 2019 to 2021 were used for Robson's Classification, meanwhile records from 2011 to 2018 were used for CS rate calculation. Files with at least 95% of the expected information were considered as complete, whereas those with less than 95% were incomplete. Each patient was then classified into one of the ten groups of the Robson classification (**Table 1**) [9]. Data were analyzed using SPSS software version 26.0. Qualitative data were expressed as numbers and percentages, meanwhile quantitative data as means and standard deviations; Odds ratios with a confidence interval at 95% was used for analytical statistics with a p value was set at 0.05.

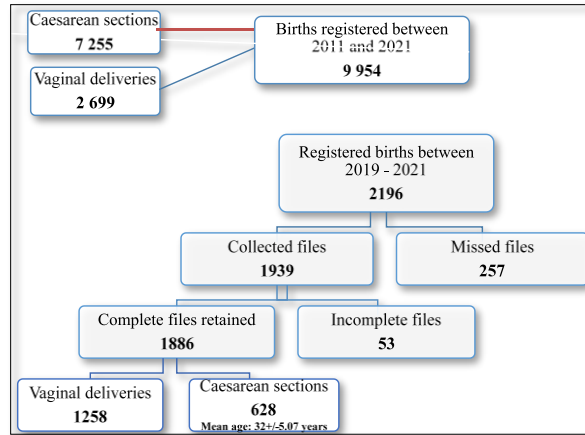
**Table 1.** MS Robson's classification.

MS Robson's classification
Group 1: Nulliparous women with a single cephalic pregnancy, at greater than or equal to 37 weeks gestation in spontaneous labor.
Group 2: Nulliparous women with a single cephalic pregnancy, at greater than or equal to 37 weeks gestation who either had labor induced (a) or were delivered by caesarean section before labor(b).
Group 3: Multiparous women, without a previous uterine scar, with a single cephalic pregnancy at greater than or equal 37 weeks in spontaneous labor.
Group 4: Multiparous women, without a previous uterine scar, with a single cephalic pregnancy at greater than or equal to 37 weeks gestation who either had labor induced(a) or were delivered by caesarean section(b).
Group 5: All multiparous women, with at least one previous uterine scar and a single cephalic pregnancy at greater than or equal to 37 weeks gestation.
Group 6: All nulliparous women with a single breech pregnancy.
Group 7: All multiparous women with a single breech pregnancy including, women with previous uterine scars.
Group 8: All women with multiple pregnancies, including women with previous uterine scars.
Group 9: All women with a single pregnancy with a transverse or oblique lie, including women with previous uterine scars.
Group 10: All women with a single cephalic pregnancy at less than or equal to 36 weeks gestation, including women with previous scars.

## RESULTS

- CPD: cephalopelvic disproportion
- Elective caesarean section: it concerns: - Persistence of the indication for the first caesarean section - History

- of at least 2 caesarean sections - History of uterine rupture - History of surgical myomectomies (group 2b) - Thin lower segment.
- IFV: *In vitro* fertilization
- TOLAC: Trial of labor after CS
- The main indications for caesarean sections at the DGH were fetal asphyxia (24.20%) followed by, elective CS (22.13%), and severe preeclampsia (9.55%) (Figure 1 & Tables 2 & 3).



**Figure 1.** Flow chart of the sampling procedure.

**Table 2.** Distribution of patients by Robson group and indication for caesarean section.

Indications of CS	Robson's Group												n (%)
	Gp1	Gp2a	Gp2b	Gp3	Gp4a	Gp4b	Gp5	Gp6	Gp7	Gp8	Gp9	Gp10	
Fetal asphyxia	34	22	3	26	16	3	15		1	5	4	23	152 (24.20)
CPD	21	-	3	9	1	1	2	-	1	2	-	-	40 (6.36)
Maternal exhaustion	2	-	2	3	1	1	2	-	1	1	-	2	15 (2.38)
Fetal macrosomia	1	-	3	1	2	2	10	-	5	2	-	1	27 (4.29)
Severe pre-eclampsia	3	1	4	3	-	-	4	-	4	7	-	34	60 (9.55)
Eclampsia	-	-	-	-	-	1	-	-	-	1	-	9	11 (1.75)
Pre-uterine rupture	-	1	-	-	-	-	-	-	-	-	1	-	2 (0.31)
Mother's option (IVF)	-	1	1	1	-	1	3	-	-	1	-	3	11 (1.75)
Failed induction	-	16	-	-	8	1	1	-	2	1	-	3	32 (5.09)
Failed TOLAC	-	-	-	-	-	-	15	-	-	-	-	1	16 (2.54)
Elective CS	-	-	7	-	-	-	111	-	4	4	3	10	139 (22.13)
Placenta Previa	-	-	2	6	-	1	2	-	2	2	2	12	29 (4.61)
Chorioamnionitis	-	-	1	1	1	-	1	-	-	1	-	3	8 (1.27)
Multiple pregnancy > 2	-	-	-	-	-	-	-	-	-	3	-	-	3 (0.47)
Short inter genesis space	-	-	-	-	-	-	4	-	-	-	-	-	4 (0.63)
Cord prolapses	-	-	-	-	-	-	-	-	1	-	1	1	3 (0.47)
Uterine rupture	-	-	-	1	-	-	3	-	1	-	-	1	6 (0.95)
Hemorrhagic placenta percreta	-	-	-	-	-	-	1	-	-	-	-	-	1 (0.15)
Fetal malformations	-	-	-	-	-	-	1	-	1	1	-	1	4 (0.63)
Abruptio placenta	-	-	-	-	-	1	-	1	2	3	1	8	16 (2.54)
Cervical dystocia	-	5	-	-	-	-	-	2	0	17	22	-	46 (7.32)

**Table 3.** Proportion of caesarean sections per group.

Variables	Caesarean sections	
	Frequency (n)	Proportions (%)
Robson's Group		
Group 1	59	9.39
Group 2	74	11.78
Group 3	52	8.28
Group 4	46	7.32
Group 5	179	28.50
Group 6	3	0.48
Group 7	25	3.98
Group 8	51	8.12
Group 9	32	5.10
Group 10	107	17.04
Total	628	100

The 03 first groups with the higher CS were group 5 (28.50%), group10 (17.04%) and group 2 (11.78%) (**Table 4**).

**Table 4.** Association between Robson's group and CS.

Robson's Classification	Mode of deliveries		OR (IC 95%)	p-value
	Caesarean sections (%)	Vaginal deliveries (%)		
Group 2a	45 (40.54)	66 (59.45)	2.704 (1.68-4.34)	0.000
Group 2b	29 (100)	0 (0)	NA	NA
Group 3	52 (7.93)	603 (92.06)	0.335 (0.22-0.50)	0.0001
Group 4a	33 (20.12)	131 (79.87)	0.888 (0.54-1.44)	0.633
Group 4b	13 (100)	0 (0)	NA	NA
Group 5	179 (72.17)	69 (27.82)	10.28 (6.90-15.32)	0.0001
Group 6	3 (30)	6 (70)	2.266 (0.64-8)	0.204
Group 7	25 (60.97)	16 (39.02)	7.649 (3.77-15.49)	0.0001
Group 8	51 (60)	34 (40)	6.25 (3.71-10.52)	0.0001
Group 9	32 (88.88)	4 (11.11)	43.627 (12.93-147.16)	0.0001
Group 10	107 (58.23)	94 (46.76)	4.425 (2.97-6.58)	0.0001
Group 1	59 (20.13)	234 (79.86)	Ref	Ref

Belonging to Robson's groups 5, 10 and 2 significantly increased the risk of caesarean section by 10 (OR: 10.28; 95% CI [6.90-15.32]; p=0.0001), 4 (OR=4.425; 95% CI [2.97-6.58]; p=0.0001) and 2 times (OR=2.704; 95% CI [1.68-4.34]; p=0.0001) respectively (**Table 5**).

**Table 5.** Maternal complications.

Complications	Robson groups									n (%)
	Gp1	Gp2b	Gp3	Gp4b	Gp5	Gp7	Gp8	Gp9	Gp10	
Intra-operative hemorrhage	-	-	1	-	4	-	-	-	4	9 (1.43)
Post-partum hemorrhage	-	1	1	-	-	-	1	-	3	6 (0.95)
Postpartum anemia	1	1	2	-	1	-	-	1	3	9 (1.43)
Wound infection	-	-	-	-	3	-	-	-	-	3 (0.47)
Endometritis	-	-	-	-	-	-	-	-	1	1 (0.15)
acute pneumopathy	-	-	-	-	-	-	-	1	-	1(0.15)
Acute kidney failure	-	-	-	-	-	1	-	-	-	1 (0.15)
HELLP syndrome	-	-	-	-	-	-	-	-	3	3 (0.47)
Anesthetic complications										
Headache	3	-	0	-	0	-	1	-	0	4 (0,63)
Cardiac arrest	-	-	-	-	-	-	1	-	-	1 (0.15)
Drug's allergy	1	-	-	-	2	-	-	-	-	3 (0.47)
Bladder injury	-	-	-	-	1	-	-	-	-	1 (0.15)
Post-partum depression	-	-	-	-	1	-	-	-	-	1 (0.15)
Decease	-	-	-	-	-	-	-	-	3	3 (0.47)
Total (%)	5	2	4	0	12	1	3	2	17	46 (7.32)

Intra-operative hemorrhage (1.43%), postpartum hemorrhage (0.95%) and postpartum anemia (1.43%) were the main maternal complications. Maternal complications were observed mainly in group 10 (2.70 %) and group 5 (1.91 %) (**Table 6**).

**Table 6.** Perinatal complications.

Complications	Frequency(n)	Percentage (%)
Fetal asphyxia	45	7.16
Neonatal infection	11	1.75
Transient tachypnea	7	1.11
Neonatal jaundice	5	0.79
Respiratory distress	6	0.95
Cyanosis	1	0.15
Difficulties swallowing	1	0,15
Death	21	3.34
Total (%)	76	12.10

Fetal asphyxia was the main perinatal complication (7,16%). Perinatal death was 3.34%, most frequent in Robson's group 10 (0.17%) and group 8 (0.06 %). Maternal death was 0.47%, only in group 10 (**Table 7**).

**Table 7.** Distribution of maternal and perinatal death by group.

Robson's group	Maternal death n (%)	Perinatal death n (%)
Group 1	0	1 (0.01)
Group 2a	0	0
Group 2b	0	1 (0.01)
Group 3	0	1 (0.01)
Group 4a	0	0
Group 4b	0	0 (0)
Group 5	0	2 (0.03)
Group 6	0	0
Group 7	0	1 (0.01)
Group 8	0	4 (0.06)
Group 9	0	0 (0)
Group 10	3(0.47)	11 (0.17)
Total (%)	3(0.47)	21 (3.34)

## DISCUSSION

The frequency of CS has increased considerably at the DGH, doubling the maximum threshold of 15% prescribed by the WHO. It increased from 18.41% in 2011 to 32.49% in 2021, with an average of 27.92%. (**Figure 2**). This CS frequency is close to that found in other referral hospitals [10,12] and high compared to the 11% frequency reported in the city of Douala in 2018 [4]. This could be explained by the fact that our study was unicentric; therefore, categories of hospitals

that could not perform high-risk deliveries were not taken into consideration. Moreover, the DGH is a referral center that manages most high-risk pregnancies in the city of Douala and its surroundings, thus which usually result in a CS. Between 2019 and 2021, the average age of women who underwent caesarean section was  $32.5 \pm 5.05$  years, range 16 to 50 years. This average age is slightly higher than that found by some authors in sub-Saharan Africa [12,14]. The pronatalist culture of sub-Saharan population could explain this situation with pregnancies in advance ages either

spontaneously or by medically assisted procreation. The main indications of CS were fetal asphyxia (24.20%), elective CS (22.13%) and severe preeclampsia (9.55%). These findings are in accordance with the results of the demographic survey in Cameroon [4]. The Robson 5 group was the leading provider of caesarean sections (28.50%) (Table 3). The second provider was group 10 (17.04%) and the third was group 2 (11.78%). Those pertaining to Robson's groups 5, 10 and 2 had a significantly increased risk of caesarean section by 10, 4 and 2 times respectively (table III). Maternal and perinatal complications were 7.32% (mainly due to intra-operative hemorrhage, postpartum hemorrhage and postpartum anemia) and 12.10 % (mainly due to fetal asphyxia) respectively (Tables 5 & 6). Group 10 had the highest maternal and fetal complications. These results are similar to those of 15. Sugianto [15] in Indonesia and Tchanchou [16] in Gabon and different from those of developed countries where group 10 is among the least providers of caesarean sections [17-20]. The rate of maternal death (0.47%) was less than that of perinatal death (3.34%)

(Table 7). Two cases of maternal death resulted from complications of coagulopathy on placenta abruptio. One case was a cardiac arrest on a uterine rupture with a delayance in referral. The delayance in referral was also observed in 60.20% of cases of fetal asphyxia. Emergency medical services with pre-hospital care remain poorly developed in sub-Saharan Africa and the developing world at large. The provision of timely treatment during life-threatening emergencies is still lacking. The main causes of perinatal death were fetal asphyxia and neonatal infection. Most of these deaths were in Robson's groups 8 and 10; making thus the poor prognosis groups. The death rates found in this study were similar to other studies done in sub-Saharan Africa: Essiben [12] reported maternal and early neonatal death of 0.49% and 5.69% respectively, while Kinenkinda [21] found 1.4% and 7.07% respectively. All our findings in this study are still raising out the necessity to urgently tackle, but efficiently, the issue of maternal and perinatal mortality and morbidity which are so far a main concern in our midst.

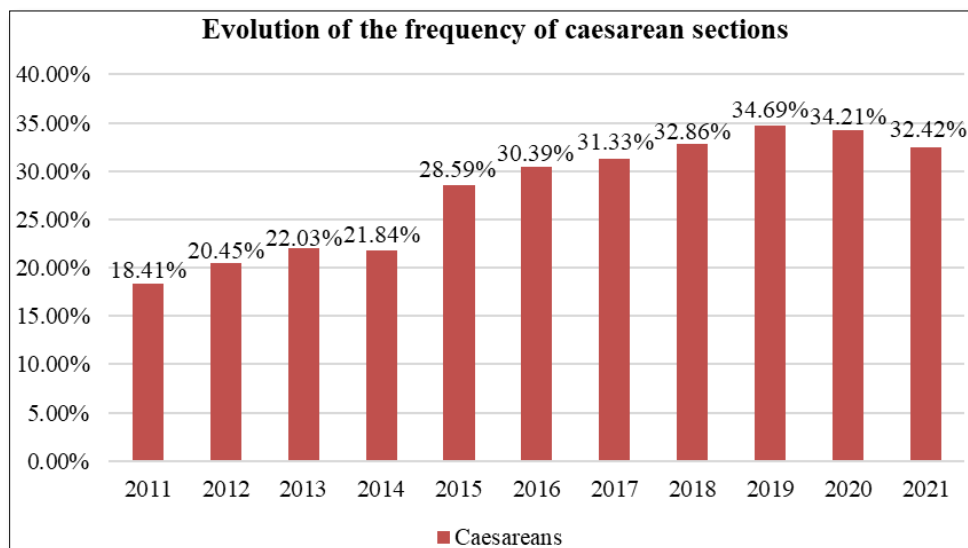


Figure 2. Evolution of the frequency of caesarean sections.

There is an overall increase rate of CS at the DGH from 2011 to 2021, with an overall average of 27.92%.

## CONCLUSION

The frequency of CS is increasing at the DGH. Fetal asphyxia, elective caesarean sections and severe preeclampsia are the main indications. Robson's groups 5, 10 and 2 are the most frequent providers of this CS. Maternal and perinatal complications are mainly intra-operative hemorrhage, postpartum hemorrhage, postpartum anemia and fetal asphyxia. Maternal and perinatal death are mainly observed in groups 10, 8 and 5.

## LIMITATION OF THE STUDY

We could not exploit entirely files from 2011 to 2018 because they were incomplete.

## STRENGTH OF THE STUDY

- It permits us to have the real CS figure in our setting
- It is among the first to evaluate CS on Robson's classification basis, in our settings.

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