

Analysis of Cesarean Sections Births using Robson's Ten Group Classification System in the Tertiary Hospital of Nepal

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Citation

Shakya S, Uprety S. Analysis of Cesarean Sections Births using Robson's Ten Group Classification System in the Tertiary Hospital of Nepal. *Kathmandu Univ Med J.* 2026; 96(3): **Online First.**

ABSTRACT

Background

Cesarean sections are life-saving in high-risk pregnancies, however its use has markedly increased in low- and middle-income countries. In Nepal, cesarean section rates rose three-fold from 1996 to 2016. The World Health Organization recommends regular auditing of cesarean section practices using Robson's "Ten Group Classification System".

Objective

To describe the obstetric population served by the maternity unit of Dhulikhel Hospital from 2019 to 2021, determine cesarean section rates using Robson's "Ten Group Classification System" and assess neonatal outcome.

Method

A retrospective cross-sectional study was conducted at the Department of Obstetrics and Gynaecology, Dhulikhel Hospital, using secondary data from 2019 to 2021. Women with complete maternity records, 8398 women, were analyzed and classified according to Robson's Ten Group Classification System. Descriptive statistics were used to calculate cesarean section rates, group sizes and each group's contributions to the overall cesarean section rates.

Result

The overall cesarean section rate was 37%, increasing from 2019 to 2021. The mean maternal age was 25.7 ± 4.7 years, most women (54%) were nulliparous and 11.4% had history of at least one previous cesarean section. Group 5 (multiparous, previous cesarean section, term, cephalic) was the largest contributor to the overall cesarean section rate (26%), followed by Group 1 (22%) and Group 2 (18%).

Conclusion

The Robson Ten Group Classification System provides a standardized framework to accurately monitor cesarean section rates and identify priority groups. Its routine implementation can support evidence-based strategies to optimize cesarean delivery practices in Nepal.

KEY WORDS

Cesarean section, Childbirth, High-risk pregnancy, Maternal age, Robson classification

INTRODUCTION

Worldwide cesarean section (CS) is the common surgical procedure and considered life-saving in case of complicated pregnancies where vaginal delivery poses life-threatening risk.¹⁻³ However, unnecessary CS exposes mothers to avoidable risks, such as placenta accreta syndrome in future pregnancy, obstetric fistula, birth asphyxia, psychosocial implications on maternal-infant relationship, challenges in initiating breastfeeding and pediatric outcomes.^{2,4}

Earlier findings indicated higher CS rates in economically developed countries, but recent trends show a growing CS in economically less developed countries.⁵⁻⁷ CS rates are increasing rapidly in South-Asia including Nepal.^{8,9} Nepal's, overall CS rate rose three-fold from 1996 to 2016, from 8.9% to 26.3% in private hospitals.¹⁰

There is no universally accepted ideal rate. World Health Organization (WHO) reported that CS rates up to 10% are associated with reduction in maternal and newborn mortality, and emphasizes that CS should be performed only when medically justified, as it carries increased risk like blood transfusion and anesthesia-related complications, organ injuries and neonatal respiratory distress.²

Auditing institutional CS is a critical quality improvement tool to identify gaps between actual practice and evidence-based standards. This could be the first step toward safely reducing a rising CS rate.¹¹ The Robson Classification Implementation Manual "Ten Group Classification System" (TGCS) was developed by WHO to standardize how hospitals monitor and analyze their CS rates (Table 1). Therefore, this study aims to describe the obstetric population and main contributors of the rising CS rate in maternal units of Dhulikhel hospital from 2019 to 2021 using Robson's TGCS along with neonatal outcome assessment.

Table 1. Robson's Ten Group Classification System

Group	Obstetric population
R1	Nullipara, single cephalic, term, spontaneous labour
R2	Nullipara, single cephalic, term, labour induced or CS before labour
R3	Multiparous without a previous CS, single cephalic, term, spontaneous labour
R4	Multiparous without a previous CS, single cephalic pregnancy, term, labour induced or CS before labour
R5	Multiparous with at least one previous CS, single cephalic at term
R6	Nulliparous, single breech
R7	Multiparous, single breech with previous CS
R8	Multi-fetal pregnancy including women with previous CS
R9	Single pregnancy with a transverse or oblique lie, including women with previous CS
R10	Single cephalic, term, including women with previous CS

METHODS

This retrospective cross-sectional study was conducted at the Department of Obstetrics and Gynaecology (OBGYN) of Dhulikhel Hospital using secondary data from 2019 to 2021. The study population included 8398 women who were admitted in the OBGYN department for the delivery of a baby.

The baseline information of all women was collected from delivery room registry that were registered at the time of admission. These basic obstetrical variables used to classify women into groups that includes gestational age, gravida, parity, fetal lie and presentation, number of fetuses and onset of labour, mode of delivery, number of previous CS and fetal outcomes (good, neonatal intensive care unit admission, early neonatal death, intrauterine fetal death and birth weight). The dependent variable was the Robson classification group and all the study information related to the groups as listed in table 1 were noted on a predesigned proforma.

Ethical approval was obtained from Kathmandu University School of Medical Sciences-IRC board (approval no. 03/22).

In our context, infants weighing ≥ 1000 grams and/or ≥ 28 weeks irrespective of fetal outcome were included. Women with missing information in maternity record book were excluded from the study.

Data cleaning, coding and statistical analysis were conducted using Microsoft Excel (Version 2508). Descriptive statistics of the study participants and variables were calculated. Results are presented as frequencies, percentages, means and standard deviations. The overall CS rate, the relative size of each group, the CS rate within each group, and each group's relative and absolute contribution to the overall CS rate were calculated over the study period. The relative size of each of the 10 groups was calculated by dividing the number of births in each group by the total number of births in the obstetric population and expressing it as a percentage. The CS rates were calculated by dividing the number of CS by the total number of births in each group and expressing this figure as a percentage. Finally, the percentage contribution made by each group to the overall CS rate was calculated by dividing the number of CS in each group by the total number of births in the obstetric population.

RESULTS

Table 2 shows characteristics of the obstetrical population according to Robson's TGCS served at the maternity unit between 2019 and 2021. During the study interval, a total of 8398 were admitted in the delivery unit. Overall, the mean age was 25.7 ± 4.7 years while most of the women, 7502 (89.5%) were between 20 to 25 years of age. More than half of the women, (53%) were multigravida and 54% were nulliparous. Only 10% of the deliveries were preterm

and 12.4% had previous CS scar. The majority, 70%, were in labour at the time of admission and had cephalic presentation (95.8%). The majority of the newborn (93.2%) had a good neonatal outcome and most of them (47.2%) had a birth weight between the range of 2500 to 3000 grams (Table 2).

Table 2. Characteristics of study participants (n= 8398)

Characteristics	n (%)
Age in years* (n=8377)	< 20 644 (7.7)
	20-35 7502 (89.5)
	> 35 231 (2.8)
Gravidity	Primigravida 3949 (47)
	Multigravida 4449 (53)
Parity	Nulliparous 4538 (54)
	Multiparous 3860 (46)
Gestational age	< 37 871 (10)
	≥ 37 7527 (90)
History of previous CS	None 7356 (87.6)
	Once 981 (11.7)
	Two or more 61 (0.7)
Labour status at the time of admission	Spontaneous labour 5882 (70)
	Not in labour 2516 (30)
Fetal Presentation	Cephalic 8046 (95.8)
	Breech 303 (3.6)
	Transverse and oblique 49 (0.6)
	Good 7887 (93.2)
Baby outcome** (n=8459)	NICU admission 425 (5)
	IUFD/NND/Still birth 147 (1.7)
Birth weight (grams)*** (n=8470)	< 2500 1263 (15%)
	2500-3000 3084 (36.4%)
	3000-4000 4003 (47.2%)
	> 4000 120 (1.4%)

*21 missing data; ** 31 missing data; *** 20 missing data
For birth outcome and birth weight, total babies were 8490, greater than total no. of delivery because of 88 twin and 2 triplet deliveries.
Abbreviations: Neonatal Intensive Care Unit (NICU), Intrauterine Fetal Death (IUFD), Neonatal Death (NND)

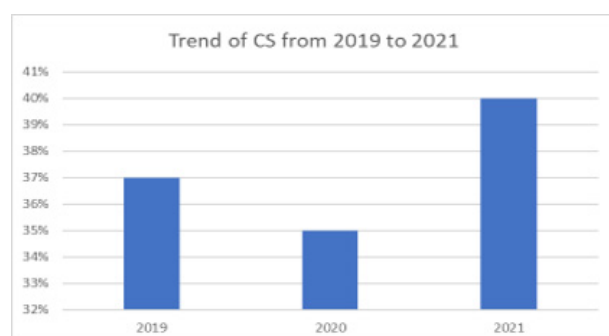


Figure 1. Trend in cesarean section delivery from 2019 to 2021 in the maternity unit of Dhulikhel Hospital

The overall CS rate of three years was 37%. The CS rate in 2019 was 37%, in 2020 it reduced to 35%, however in 2021 it increased to 40% which shows the overall increasing trend of CS rate (Fig. 1).

All deliveries during the study period were classified according to Robson's TGCS (Table 3). Group-1 (Nullipara, single cephalic pregnancy, term with spontaneous labour) were the largest obstetric group, accounting for 2815 (34%) of all deliveries and 24% of them had cesarean delivery. This group contributed 8.1% to the overall CS rate (37%) and represented 22% of all CS performed. Group 2 (Nullipara, single cephalic term with labour induced or CS before labour) accounted for 1,124 (13%) of all deliveries and 50% of them delivered by CS. This group contributed to 6.7% of overall CS rate and represented 18% of all CS performed.

Group 3 (Multiparous without previous CS, single cephalic pregnancy, term in spontaneous labour) accounted for 1798 (21%) of all obstetric population and 15% of them had CS, contributing 3.2% to the overall CS rate (37%) and 9% of all CS performed. Group 4 (Multiparous without previous CS, single cephalic term who had labour induced or CS before labour) comprised 607 (7%) all obstetric deliveries and had a CS rate of 33%, contributing 2.4% to the overall CS rate (37%) and 6% of all CS performed.

Group 5 (Multiparous with at least one previous CS, single cephalic term) constituted 874 (10%) of obstetric population and 92% of them had CS, contributing 9.6% to the overall CS rate (37%) and 26% of all CS performed, which is the highest contribution among ten groups.

Group 6, 7, 8 and 9 had least contribution to the obstetric population and overall CS performed. Group 6 (Nulliparous, single breech) accounted for only 166 (2%) of all deliveries and 84% of them had CS, contributing 2% to the overall CS rate (37%) and 4% to all CS performed. Group 7 (All women with multiple pregnancies including women with previous CS) accounted for 121 (1%) of all deliveries and 65% of them had CS, contributing 1% to the overall CS rate (37%) and 3% to all CS performed. Group 8 (multi-fetal pregnancy including previous CS) also accounted for 85 (1%) of all deliveries and 57% of them had CS, contributing 1% to overall CS rate (37%) and 2% to all CS performed. Group 9 (All women, single transverse or oblique lie, including previous CS) accounted for only 48 (0.5%) of all deliveries and 100% of them had CS contributing 1% to overall CS rate as well as all CS performed.

The last group, Group 10 (All women, single cephalic, including with previous CS) constituted 760 (9%) of the obstetric population and 40% of them had CS, contributing 4% to the overall CS rate and 10% to all CS performed.

DISCUSSIONS

The overall CS rate in Dhulikhel Hospital from 2019 to 2021 was 37%, which is higher than a recommended by

Table 3. Distribution of delivery using Robson's Ten Group Classification System in Dhulikhel Hospital Nepal, 2019–2021 (n=8398)

Group	Description	No. of CS	No. of deliveries	Relative (%) size of group	CS rate (%) in each group	Absolute contribution (%) on the overall CS rate	Relative (%) contribution on the overall CS rate
1	Nullipara, single cephalic, term, spontaneous labour	677	2815	34	24	8.1	22
2	Nullipara, single cephalic, term, labour induced or CS before labour	565	1124	13	50	6.7	18
3	Multiparous without a previous CS, single cephalic, term, spontaneous labour	268	1798	21	15	3.2	9
4	Multiparous without a previous CS, single cephalic pregnancy, term, labour induced or CS before labour	203	607	7	33	2.4	6
5	Multiparous with at least one previous CS, single cephalic at term	805	874	10	92	9.6	26
6	Nullipara, with single breech pregnancy	139	166	2	84	2	4
7	Multipara, with single breech pregnancy including women with previous CS	79	121	1	65	1	3
8	Multiple Pregnancy including women with previous CS	48	85	1	57	1	2
9	Single pregnancy with transverse or oblique lie, including women with previous CS	48	48	0.5	100	1	1
10	Single cephalic pregnancy <37 weeks gestation, including women with previous CS	300	760	9	40	4	10
Total		3132	8398	100%	-	37%	100%

the WHO (15%).² On seeing three years trend at Dhulikhel hospital, the CS rate slightly reduced from 37% in 2019 to 35% in 2020. The reduction in 2020 may be possibly due to COVID lockdown leading to less hospital delivery at that period of time.¹² However, in 2021 the CS rate increased to 40%. A similar, increasing trend was seen in another tertiary hospital of Nepal, where CS delivery rate was 39%, 52.7% and 56% during the year 2014, 2019 and 2024 respectively.¹³

Nullipara, single cephalic term pregnancy irrespective of onset of labour and mode of delivery (group 1 and 2) were the most prevalent obstetric group (47%) followed by group three and four (Multiparous term singleton term pregnancy without CS scar, 28%) and group 5 (multiparous, singleton term pregnancy cephalic presentation with history of at least on previous CS, 10%). The finding suggest that the hospital serves a population with relatively low fertility rates and coincides with low fertility rate ranging from 1.31 to 1.75 of Bhaktapur, Kavre, Sindhupalchowk and Sindhuli districts, the major catchment areas of Dhulikhel hospital.^{14,15}

Analysis of data using Robson's Ten Group Classification System, the key contributors to the overall CS rate at Dhulikhel hospital were identified. Robson Group 5 (Multiparous with at least one previous CS, single cephalic at term) was the largest contributor to the overall CS rate (26%) and CS rate withing the group was 92%, accounting for more than one-quarter of all CS, consistent with other findings from Nepal, India and other South Asian countries.^{16,17} The highest CS among women in Group 5 in this study could be due to reduced practice of trials of labour in women with uterus scar at Dhulikhel hospital. A study done in Manipur, India found history of one or more

previous CS delivery as the main indication for high CS in this group.¹⁸ The very high CS rate in this group reflects limited utilization of vaginal birth after caesarean (VBAC) and one of the reasons could be due to fear of complications associated with procedure.¹⁸

Robson Group 1 (Nullipara, single cephalic, term, spontaneous labour) was the second largest contributor to the overall CS rate. Similar observations have been reported in other studies, where Group 1 is either the leading or the second leading contributor to overall CS rates.^{16,19,20} In a study from tertiary care hospital in Uttarkhand, India similar result was found where Group 1 represented the second largest share of overall CS delivery where indication for CS were fetal distress, non-progress of labour and cephalopelvic disproportion.²¹ Further investigation on indication of CS among women in this group at Dhulikhel hospital need to be done, and based on the result targeted intervention in this group could result in meaningful reductions in overall CS rates.

Group 2 (Nullipara, single cephalic, term, labour induced or CS before labour) was the third major contributor to overall CS rate. This finding is similar to prior studies that found a positive association between labour induction and CS.¹⁶ Studies have highlighted that careful case selection for induction and adherence to standardized induction protocols have potential in reducing CS in this group.^{22,23}

Group 3 (Multiparous without a previous CS, single cephalic, term, spontaneous labour) and Group 4 (Multiparous without a previous CS, single cephalic, term, labour induced or CS before labour) contributed modestly to the overall CS rate, with lower CS rates compared to nulliparous groups, as reported in other studies.¹³ Nonetheless, the higher

group CS rate in Group 4 compared to Group 3 suggests the need of reviewing indications for labour induction, the basis of decisions to undergo CS in multiparous women without previous CS.

High CS rates were observed in women in Robson Groups 6, 7, 8, and 9, consistent with common obstetric practice for breech presentations, multiple pregnancies, and abnormal lies. However, their individual group contribution to overall CS rate remained small as also noted in other studies.⁹

The prevalence of Robson Group 10 (Single cephalic pregnancy, < 37 weeks, including women with previous CS) is 9%. Group 10 accounted for a notable 10% of all CS delivery, likely reflecting the complexity of preterm pregnancies and associated maternal or fetal complications, similar to findings from other studies from the South-Asian region.^{3,4} These findings shows that the Dhulikhel hospital maternal units is the in-utero-referral site for women with preterm labour and deliveries.

Regarding early neonatal outcomes, table 2 highlights that vast majority of newborns (93.2%) achieved a good clinical outcome during their hospital stay, with 47.2% falling within the healthy, normal birth weight range of 2500 to 3000 grams. However, the data also shows that 10% of the deliveries were pre-term (< 37 weeks gestation). In the South Asian context, prematurity and low birth weight remain primary determinants of neonatal morbidity and mortality, frequently precipitating complications such as respiratory distress syndrome, neonatal sepsis and metabolic instability.^{24,25} The notable burden of preterm deliveries closely aligns with our high CS rates, such as the 10% contribution from Robson group 10.²⁶ This shows that Dhulikhel hospital serves as a key referral center that provides essential NICU care to protect high risk newborns.

Ultimately, the Robson classification itself does not directly identify the reason for CS but can be the common starting platform for recognizing patterns to identify the reasons of

performing CS by conducting further analysis of indications for CS in each Robson group as required.¹² Likewise, this classification can be a useful foundation for further detailed analysis and comparison of all perinatal events and outcomes and adding epidemiological variables.

However, this study has few limitations. First, it is a single-center study conducted in a tertiary hospital which manages more complicated and high-risk pregnancies, so, the CS rate may be higher and might not represent general population of Nepal. Second, the study period covers the COVID-19 pandemic, which might have influenced the hospital delivery trends during 2020 and 2021, resulting in less deliveries during that period.

CONCLUSION

The study provides insides into the obstetrical population served by Dhulikhel hospital, the CS rates of each Robson's group, absolute and relative contribution of each group to the overall CS rate. The increasing trend of CS nationally and globally reflects the concern and needs for standardized policy regarding CS delivery requirements. Involvement of senior obstetrician and women in antepartum and intrapartum period for shared decision making supported by adequate counselling on risk and benefit of CS delivery is necessary. Current data based The Robson's Ten Group Classification System provides a reliable framework for monitoring and comparing CS rate in subsequent years with accuracy and identification of priority groups requiring careful investigation to reduce unnecessary CS. It should be routinely used as an evidence-based audit tool to guide targeted strategies for reducing CS in Nepal.

ACKNOWLEDGEMENTS

We would like to thank the maternity unit of the Department of Obstetrics and Gynaecology of Dhulikhel Hospital for their contribution in providing maternity records for this study.

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