

# BMJ Open Can the Robson 10 Group Classification System help identify which groups of women are driving the high caesarean section rate in major private hospitals in eastern Ethiopia? A cross-sectional study

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## ABSTRACT

**Objective** The rates of caesarean section (CS) in Ethiopian private hospitals are high compared with those in public facilities, and there are limited descriptions of groups of women contributing to these high rates. The objective of this study was to describe the groups contributing to increased CS rates using the Robson classification in two major private hospitals in eastern Ethiopia.

**Design** Cross-sectional study.

**Setting** Two major private hospitals in eastern Ethiopia.

**Participants** All women who gave birth from 9 January 2019 to 8 January 2020 in two major private hospitals in eastern Ethiopia.

**Primary and secondary outcome measures** The primary outcome was the Robson 10 Group Classification System. The secondary outcome was indication for CS as recorded in the medical files.

**Results** Of 1203 births in both hospitals combined during the study period, 415 (34.5%) were by CS. Women with a uterine scar due to previous CS (group 5), single cephalic term multiparous women in spontaneous labour (group 3) and single cephalic term nulliparous women in spontaneous labour (group 1) were the leading groups contributing 33%, 27.5% and 17.1%, respectively. The leading documented indications were fetal compromise (29.4%), previous CS (27.2%) and obstructed labour (12.3%).

**Conclusion** More than three-fourths of CS were performed among Robson groups 5, 3 and 1, indicating inadequate trial of labour after CS or management of labour among relatively low-risk groups (3 and 1). Improving management of spontaneous labour and strengthening clinical practice around safely providing the option of vaginal birth after CS practice are strategies required to reduce the high CS rates in these private facilities.

## INTRODUCTION

Although caesarean section (CS) is a life-saving intervention when vaginal delivery is deemed to be of higher risk for the woman or the newborn, there is no significant

## Strengths and limitations of this study

- This is the first study to apply the Robson classification to private hospitals in Ethiopia.
- Because routinely collected clinical data were used, some sociodemographic variables of interest were missed.
- The retrospective nature of the study may be prone to incomplete documentation.

improvement in maternal and neonatal health outcomes when the population-based CS rate is higher than 15%.<sup>1,2</sup> From being performed to save the life of the woman or the neonate, CS is also being performed for non-absolute indications, such as maternal request or obstructed labour with intact membrane.<sup>3</sup> The overall rate of CS in Ethiopia is one of the lowest (0.6%), with huge regional variations.<sup>4</sup> Moreover, the rates of CS significantly vary within and among countries, with women from urban areas, literate women and those visiting private facilities having more CS compared with their counterparts.<sup>4,5</sup>

With the unprecedented rise in CS rates, there is a need to institute a robust system to minimise unnecessary and medically non-indicated CS.<sup>6</sup> The risks associated with (repeated) CS for women and newborn are well established.<sup>7–9</sup> These range from increased risk of uterine rupture and abnormal placentation in women to stillbirth and iatrogenic preterm birth in babies. Moreover, long-term effects on hormonal, physical, bacterial and physiological conditions and risk of allergic reactions to the newborn have also been reported.<sup>9</sup>

A recommended system for clinical auditing of CS is the Robson 10 Group Classification

**Table 1** Robson 10 Group Classification System for caesarean section<sup>12</sup>

Group	Description
1	Nulliparous, single cephalic, $\geq 37$ weeks, in spontaneous labour.
2	Nulliparous, single cephalic, $\geq 37$ weeks, induced or CS before labour.
3	Multiparous (excluding previous CS), single cephalic, $\geq 37$ weeks, in spontaneous labour.
4	Multiparous (excluding previous CS), single cephalic, $> 37$ weeks, induced or CS before labour.
5	Previous CS, single cephalic, $\geq 37$ weeks.
6	All nulliparous breeches.
7	All multiparous breeches (including previous CS).
8	All multiple pregnancies (including previous CS).
9	All abnormal lies (including previous CS).
10	All single cephalic, $< 37$ weeks (including previous CS).

CS, caesarean section.

System.<sup>9–11</sup> Based on obstetric history, course of labour and gestational age, the Robson classification categorises all women undergoing CS into 10 mutually exclusive and exhaustive groups.<sup>12–14</sup> Although the Robson classification has been promoted by the WHO as a method to reduce the rates of CS,<sup>13 15 16</sup> the system has rarely been applied to private facilities in Africa.<sup>17 18</sup>

Given the increase in global rates of CS, including in low-income and middle-income countries,<sup>2 19–21</sup> and in private facilities in particular, audit of CS practices and identifying groups contributing to CS rates using the Robson classification are important to design appropriate interventions.<sup>17 22–26</sup> To the best of our knowledge, no such study has been performed in private facilities in Ethiopia, rendering the contribution of different groups to overall CS rates in these institutions unknown.<sup>27 28</sup>

The aim of this study was to determine which groups are driving the CS rate in selected major private hospitals in eastern Ethiopia using the Robson 10 Group Classification System.

## METHODS

### Study design and participants

This study was conducted as part of a larger study on maternal near miss and mortality in major private hospitals in eastern Ethiopia, which has been described elsewhere.<sup>29</sup> In brief, all women who were admitted from 9 January 2019 to 8 January 2020 in two major private hospitals in eastern Ethiopia during pregnancy, childbirth or within 42 days of termination of pregnancy were identified. Then, all women who fulfilled the adapted sub-Saharan African maternal near miss criteria were identified.<sup>30</sup> Finally, data on sociodemographic conditions, reproductive and obstetric factors, and respective

**Table 2** Sociodemographic conditions of women who underwent CS in selected private hospitals in eastern Ethiopia, 2020

Variable	Frequency	%
<b>Age</b>		
<20	37	8.9
20–35	356	85.8
>35	22	5.3
<b>Residence</b>		
Urban	293	70.6
Rural	122	29.4
<b>Type of CS</b>		
Elective	85	20.5
Emergency	350	79.5
<b>Referral status</b>		
Self-referral	394	94.9
Referred from other facilities	21	5.1
<b>Antenatal care (at least one)</b>		
Yes	387	93.3
No	28	6.7
<b>Parity</b>		
0	95	22.9
1–4	285	68.7
>4	35	8.4
<b>Gestational age (weeks)<sup>37</sup></b>		
Preterm (<37)	9	2.2
Term (37–41 6/7)	400	96.4
Post-term ( $\geq 42$ )	6	1.4
<b>Onset of labour</b>		
Spontaneous	285	68.7
Induced	24	5.8
CS before labour	106	25.5
<b>Fetal presentation</b>		
Cephalic	393	94.7
Breech	18	4.3
Transverse	4	1
<b>Birth weight (g)</b>		
<2500	12	2.9
2500–4000	393	94.7
>4000	10	2.4

CS, caesarean section.

feto-maternal outcomes at discharge were collected from those identified as near miss or not (for comparison). The study was retrospectively conducted from 1 February to 29 February 2020 at the department of obstetrics and gynaecology of hospital 1 and hospital 2—the two major private hospitals in Harar and Dire Dawa towns in eastern Ethiopia. As part of this study, data on category of

pregnancy, presence of previous uterine scar, course of labour and delivery, and gestational age, which are essential for the Robson classification,<sup>12</sup> were collected from all women who gave birth. To enable comparisons, records of women who gave birth vaginally were also reviewed. The identity of all women who visited both hospitals for maternity services was obtained from the admission and discharge registers, delivery logbooks and operation theatre registers. Using their medical registration number, all files were retrieved from the archive rooms at both hospitals and reviewed by research assistants who received dedicated inservice training.

### Study setting

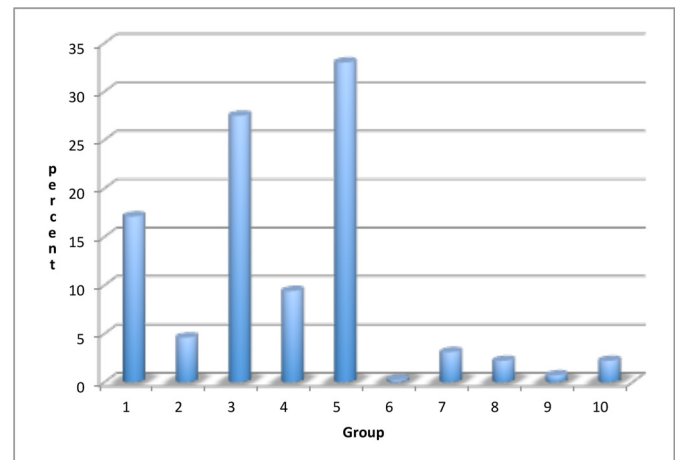
Hospital 1 is a general specialised 33-bed private hospital in Harar providing specialised care in internal medicine, surgery, obstetrics and gynaecology, paediatrics and child health, and some other smaller fields. During the study period, five consultants and six midwives were practising at the department of obstetrics. It provides care for both emergency and planned CS by consultants, with approximately 1000 births annually. Hospital 2 is one of the major private hospitals in Dire Dawa with almost 600 deliveries annually. Both hospitals have one major operation theatre which they share with all surgical specialties. Unlike public facilities, where all maternity services are free of charge,<sup>31</sup> a typical CS procedure costs 10000–15000 Ethiopian birr (\$267–400).

### Variables

The dependent variable was the Robson classification groups 1–10 based on the category of pregnancy, presence of previous uterine scar, course of labour and delivery, and gestational age of pregnancy (table 1).<sup>12</sup> The independent variables included sociodemographic conditions (age, referral status, residence), medical and obstetric history, and conditions present in the index pregnancy.

### Data collection

This study was conducted as part of a larger study on maternal near miss.<sup>29</sup> The near miss study was conducted to assess the magnitude of near miss among all women admitted to the department of obstetrics and gynaecology. All women who fulfilled any of the sub-Saharan African maternal near miss criteria were included in the main study.<sup>30</sup> Trained research assistants collected data on maternal characteristics (age, parity, antenatal booking, referral status), obstetric and medical history, and conditions (history of uterine scar, history or presence of obstetric complications), labour and delivery-related information (onset, presentation, mode of birth, indication for CS for births by CS), fetal/neonatal information (vital status at birth, fifth minute Apgar score, admission to special intensive care unit, birth weight), presence of maternal near miss events, and maternal and fetal outcome at discharge.



**Figure 1** Distribution of women undergoing caesarean section according to the Robson groups in selected private hospitals in eastern Ethiopia, 2020.

### Data processing and analysis

All collected data were cross-checked for completeness and consistency and double-entered to EpiData V.3.1 (<http://www.epidata.dk>) and exported to Stata V.13 (<https://www.stata.com>) for analysis. The Robson group was determined using the four basic obstetric concepts and their parameters—pregnancy category, history of CS, course of labour and gestational age.<sup>12</sup> In addition, indications reported for CS were classified as absolute and non-absolute indications as per the recommendation of Stanton and Ronsmans.<sup>32</sup> Absolute indications included obstructed labour, major antepartum haemorrhage (including placenta previa grades 3 and 4), malpresentation (transverse, oblique and brow presentation) and uterine rupture in hierarchical order. Non-absolute indications included history of CS, fetal compromise, failure to progress (prolonged labour, failed induction), breech presentation, severe pre-eclampsia and eclampsia without hierarchical order.

### Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting or dissemination plans of this research.

### RESULTS

During the study period, 1287 maternity admissions were reported. After excluding 73 (5.7%) lost or incomplete files, 1214 records with complete data were reviewed, constituting 1203 births (excluding abortions and laparotomies not resulting in births). A total of 415 births were by CS, making the overall CS rate 34.5% (277 of 839, 33% in hospital A; 138 of 364, 37.9% in hospital B). The mean age of participants was 26.7 ( $\pm 5.3$ ) years, ranging from 17 to 40 years old. The mean gestational age was 38.9 ( $\pm 1.6$ ) weeks. The majority of women were married (98.8%), urban residents (70.6%) and self-referred

**Table 3** Distribution of Robson groups and their contribution to the overall CS rate in selected private hospitals in eastern Ethiopia, 2020

Group	Description	CS/all births in the group	Contribution per group to total births (%)	CS rate within group (%)	Contribution per group to the CS rate (%)
1	Nulliparous, single cephalic, $\geq 37$ weeks, in spontaneous labour.	71/197	16.4	36.0	17.1
2	Nulliparous, single cephalic, $\geq 37$ weeks, induced or CS before labour.	19/27	2.2	70.4	4.6
3	Multiparous (excluding previous CS), single cephalic, $\geq 37$ weeks, in spontaneous labour.	114/690	57.4	16.5	27.5
4	Multiparous (excluding previous CS), single cephalic, $\geq 37$ weeks, induced or CS before labour.	39/72	6.0	54.2	9.4
5	Previous CS, single cephalic, $\geq 37$ weeks.	137/153	12.7	89.5	33.0
6	All nulliparous breeches.	1/1	0.1	100	0.24
7	All multiparous breeches.	13/22	1.8	59.1	3.1
8	All multiple pregnancies (including previous CS).	9/15	1.2	60	2.2
9	All abnormal lies (including previous CS).	3/3	0.3	100	0.7
10	All single cephalic, $\leq 36$ weeks (including previous CS).	9/23	1.9	39.1	2.2
Total		415/1203	100	34.5	100

CS, caesarean section.

(94.9%). Details of sociodemographic conditions are summarised in [table 2](#).

### Analysis of the Robson classification

The three leading Robson groups were group 5 (n=137, 33%), group 3 (n=114, 27.5%) and group 1 (n=71, 17.1%). The overall contribution of the 'high risk groups' (groups 6, 7, 8 and 9) to the overall CS rate was almost nil (6.2%). Details of the Robson groups and their respective contributions are summarised in [figure 1](#) and [table 3](#).

### Overall and within-group indication for CS

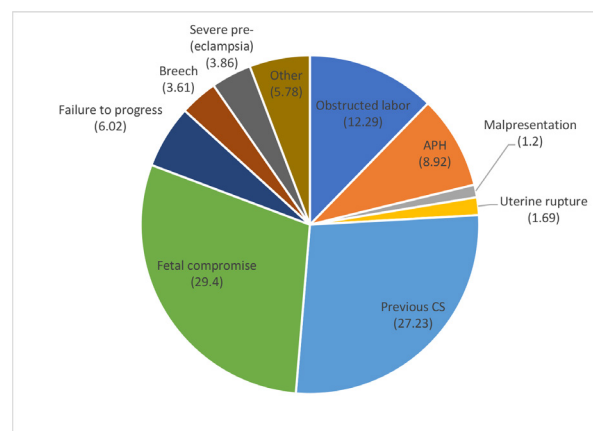
As indicated in [figure 2](#), the leading indications for performing CS in this study were fetal compromise (29.4%), previous CS (27.2%) and obstructed labour (12.3%). In general, CS was performed for absolute indications in 24.1% only ([figure 2](#)).

The major indications within each Robson group are summarised in [table 4](#). Except for Robson groups 9 and 10, where malpresentation (n=3/3) and major antepartum haemorrhage (n=5/9) were the leading indications, non-absolute indications were the main indications in all other groups: fetal compromise in group 1 (n=40/71, 56.3%) and group 3 (n=68/114, 59.6%); previous CS in group 5 (n=106/137, 77.4%); and breech presentation in

group 6 (n=1/1, 100%), group 7 (n=10/13, 76.9%) and group 8 (n=4/9, 44.4%).

### DISCUSSION

This study was conducted to describe CS in selected private hospitals using the Robson classification. We found



**Figure 2** Indications for performing CS in selected private hospitals in eastern Ethiopia, 2020. APH, antepartum haemorrhage; CS, caesarean section.

**Table 4** Overall and within Robson group indications for performing CS in selected private hospitals in eastern Ethiopia, 2020

Indications	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10	Total
<b>Absolute indications</b>											
Obstructed labour	19	2	24	2	4	0	0	0	0	0	51
Major APH	2	1	14	6	9	0	0	0	0	5	37
Malpresentation	0	0	0	0	0	0	0	2	3	0	5
Uterine rupture	0	0	0	0	7	0	0	0	0	0	7
<b>Non-absolute indications</b>											
Previous CS	0	0	2	2	106	0	2	1	0	0	113
Fetal compromise	40	0	68	4	5	0	1	1	0	3	122
Failure to progress	4	6	1	13	1	0	0	0	0	0	25
Breech presentation	0	0	0	0	0	1	10	4	0	0	15
(Severe pre-eclampsia) eclampsia	5	2	4	1	3	0	0	0	0	1	16
Others	1	8	1	11	2	0	0	1	0	0	24*
<b>Total</b>	<b>71</b>	<b>19</b>	<b>114</b>	<b>39</b>	<b>137</b>	<b>1</b>	<b>13</b>	<b>9</b>	<b>3</b>	<b>9</b>	<b>415</b>

\*18 on maternal requests and 6 unspecified.  
 APH, antepartum haemorrhage; CS, caesarean section.



that women with a history of CS in a previous pregnancy (group 5), single cephalic multiparous women at term in spontaneous labour with no history of CS (group 3) and single cephalic nulliparous women at term and in spontaneous labour (group 1) were the leading Robson groups contributing to 8 in 10 CS. In addition, the relatively moderate risk groups (groups 1–4 combined) contributed 58.6% of all CS in the participating private hospitals. The leading recorded indications for performing CS were fetal compromise, previous CS and obstructed labour. Although the application of Robson classification for auditing CS is common practice, to the best of our knowledge this is only the second reported study to apply this classification to private hospitals in a low-income and middle-income country after the study by Begum *et al*<sup>18</sup> in Bangladesh.

Our finding is consistent with a study previously conducted in a public university hospital in the same setting, although in a different order, where groups 3, 5 and 1 were the leading contributors.<sup>28</sup> However, the contribution of group 5 in our study is much higher compared with the previous study (33% vs 21.4%). The fact that women with no previous CS (groups 1, 2, 3 and 4) contributed to 6 in 10 (58.6%) and mainly for non-absolute indications—fetal compromise and failure to progress—indicates the need to assess appropriateness of labour management in private settings. Minimising primary CS in these low-risk groups is essential since women with CS scar would often undergo CS.

Looking into the quality of data as per the WHO recommendation<sup>13</sup> shows good quality of data. The size of group 9 is in the expected range of <1% (0.3), with an overall CS rate of 100%. In addition, looking into the relative size of the combination of ‘groups 1 and 2’ (18.6%) and ‘groups 3 and 4’ (63.3%) in table 3 (column 3) shows the presence of high multiparous women in the database, as evidenced by high total fertility rate (4.6) in the country.<sup>33</sup> It may also reflect high vaginal delivery among women without prior scars. Furthermore, the ratio of ‘group 3 to 4’ is higher than the ratio of ‘group 1 to 2’, indicating good quality of data.<sup>13</sup> However, the ratio of ‘group 6 to 7’ was very low (0.05) compared with the expected high breeches among nulliparas compared with multipara. Given the quality of our data is acceptable as indicated by other parameters above, this requires further audit.

Given that groups 5, 3 and 1 constitute large demographic shares, it was expected that these would contribute largely to the overall CS. However, the fact that CS rates within these groups were 89.5%, 16.5% and 36.0%, respectively, indicates vast opportunities to reduce CS rates by strengthening clinical practice around vaginal birth, including vaginal birth after CS. The numbers do raise concerns about quality of care around vaginal birth in private care facilities in Ethiopia. Although group 5 comprised 12.5% of all births, it contributed 33% to the overall CS rate, possibly indicating low utilisation of trial of labour or instrumental vaginal birth. Trial of labour in sub-Saharan Africa in general is low,<sup>34</sup> although

this practice may be justified in a majority of women with a previous scar if combined with proper labour monitoring.<sup>35</sup>

### Strengths and limitations

This study is the first to apply the Robson classification to major private hospitals in Ethiopia. Inclusion of all women who gave birth in both facilities (CS and vaginal deliveries) during the study period helped us to indicate the Robson distribution as a whole and also among those who had CS without selection bias. However, the study has some limitations to be considered. First, as the data were retrospectively collected from medical records, some important socioeconomic variables which are not routinely documented were missed. Second, data on trial of labour or partograph use are not often documented, making it difficult to comment on management of labour and timeliness of the decisions to undergo CS.

### CONCLUSION

More than three-fourths of CS were performed among Robson groups 5, 3 and 1, indicating inadequate trial of labour after CS or management of labour among relatively low-risk groups (3 and 1). Although the overall CS rate in this study is not as high as those reported in private hospitals in some other clinics, it requires further study since a majority (68%) of women who have undergone CS did not have any underlying obstetric complications.<sup>36</sup> In addition, the high CS rate among women with a scarred uterus (89.2%) requires further audit of the obstetric interventions provided to these women. Since these private hospitals are well equipped with fetal monitoring and the ability to perform CS quickly, trial of labour after CS should be attempted and the missed opportunities should be further explored.

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**Contributors** AKT conceived the study and wrote the original draft of the manuscript, which was subsequently reviewed by SG, SGF and TvDA. SG was involved in proposal development and collected data under the supervision and mentorship of AKT. Analysis was done by AKT. SG, SGF and TvDA reviewed the manuscript for intellectual content and participated in the revision. All authors contributed to the writing and reviewed the article and approved the final version of the manuscript to be published.

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**Competing interests** None declared.

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**Patient consent for publication** Not required.

**Ethics approval** This study was approved by the institutional health research ethics review committee of the College of Health and Medical Sciences, Haramaya University, Ethiopia (IHRERC/045/2020).

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available upon reasonable request. All data relevant to the study are included in the article or uploaded as supplementary information. Data essential for conclusion are included in the manuscript. Additional data can be obtained from the corresponding author on reasonable request.

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