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Analysis of cesarean section using Robson's criteria in tertiary care center

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Abstract

Introduction: This study aims to analyze all the women delivering in our institute according to the Robson classification. Robson ten group classification system (TGCS) endorsed by WHO, is a global standard tool for assessing, monitoring and comparing cesarean section rates at all levels.

Method: This cross sectional study was conducted in the department of obstetrics and gynecology, Patan hospital, Patan academy of health sciences (PAHS), Lalitpur, Nepal over 12 months' period. All women who delivered during this period were classified according to the Robson classification (TGCS) into a specific group. Relative size and overall cesarean section rate of each group were calculated.

Result: A total of 4,985 cases were analyzed. The cesarean section rate was 57.7%. Group 1+2 represented nearly half (49%) of the obstetric population served during the study period. Group 2A was found to be the highest contributor (27.4%) followed by Group 5 (22.8%) and Group 1 (13.0%). In terms of indication for cesarean section -Fetal distress and previous cesarean section were found to be the most common indications. Similarly, nulliparous women were three to four times more likely to be delivered by cesarean section when labor was induced.

Conclusion: From this study, we can conclude that for an effective reduction in the overall high cesarean section rate in our Institution, we need to focus on a more stringent protocol for inducing labor especially among nulliparous women and to practice evidence based guidelines. Redefining failed induction needs to be considered critically as well.

Keywords: Cesarean section, failed induction, preterm cesarean section, cesarean audit, Robson ten group classification system

Introduction

The World Health Organization (WHO) states that, one in every five deliveries is by cesarean section.¹ However; studies have shown that this increase is without any clear evidence of concomitant decrease in neonatal and maternal mortality and morbidity as expected.²

In Nepal, institutional deliveries have been on the rise steadily from 10% in 1996 to 80% in 2022.³ The NDHS 2016 reports the proportion of births delivered by cesarean section in Nepal to have increased from 5% in 2011 to 9% in 2016.⁴ Similarly, in our institute, a study published in 2015, showed an upward rising trend of cesarean rate from 38.4% in 2010 to 46.9% in 2014, although the total deliveries remained the same.⁵

In 2015, WHO endorsed the Robson classification as a global standard tool for assessing, monitoring and comparing cesarean section rates within and between health care facilities and countries and trends over time.^{6,7}

Robson ten group classification system (TGCS) is a complete perinatal classification which classifies every woman who is admitted for delivery based on a few basic characteristics. An audit of cesarean section deliveries in institutions using the TGCS is an important tool to assess which groups of women is the main contributors to the increase in overall cesarean section rate.

The objective of this study is to assess the prevalence rate of cesarean section in our institute and perform an analysis based on the Robson ten group classification system.

Method

This was a cross sectional study conducted at Patan academy of health sciences, Lalitpur, Nepal which is a tertiary level facility with an annual delivery rate of 6000-7000. It is a government teaching hospital which also serves as a referral center for high risk cases from all over the country.

Table 1. The Robson Classification with subdivisions

Group 1	Nulliparous women with single cephalic pregnancy, ≥ 37 weeks gestation in spontaneous labour
Group 2a	Nulliparous women with single cephalic pregnancy, ≥ 37 weeks gestation who had labor Induced
Group 2b	Nulliparous women with single cephalic pregnancy, ≥ 37 weeks gestation who delivered by cesarean section before labor
Group 3	Multiparous women without a previous uterine scar, with single cephalic pregnancy, ≥ 37 weeks gestation in spontaneous labour
Group 4a	Multiparous women without a previous uterine scar, with single cephalic pregnancy, ≥ 37 weeks gestation who had labor induced
Group 4b	Multiparous women without a previous uterine scar, with single cephalic pregnancy, ≥ 37 weeks gestation who were delivered by cesarean section before labor
Group 5.1	All multiparous women with at least one previous uterine scar ,with single cephalic pregnancy ≥ 37 weeks gestation
Group 5.2	All multiparous women with ≥ 2 previous uterine scar ,with single cephalic pregnancy ≥ 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 < 37 weeks gestation including women with previous uterine scars

The study covered all women who delivered in our institution from March 2021 to February 2022. Exclusion criteria included all the preivable deliveries before 28 weeks. Based on the six core variables (parity, previous cesarean section, onset of labor, gestational age of the fetus and fetal lie and presentation) all women admitted for delivery were assigned to one of the ten groups as per Robson ten group classification system (Table1). Once the woman was classified, her specific group was marked in her admission record. The classification was reviewed again after birth for any change in the variables (example: onset of labor might change) and if any change was noted then the group was reclassified. A special column was also created in the delivery room log book where the groups were recorded along with her delivery details.

Data entry, coding and cleaning were done in Microsoft Excel. Line diagram and bar chart were also prepared as graphical representation of the results. For association of the categorical data, Chi square test was also performed. Odds ratio was also calculated to quantify the results. The entire statistical test was done in Statistical Package for Service solution (IBM SPSS Statistics for Windows, Version 20). P value<0.05 was considered as statistically significant. Ethical approval for this study was obtained from the institutional review committee of Patan Academy of Health Sciences.

Result

During the study period of one year, total number of 4985 deliveries was conducted. The highest delivery was by caesarean section 2867(57.5%) followed by vaginal delivery 2071(41.5%). while instrumental delivery was minimal 47(1%).

In terms of the size of the study population, nearly half were from Group1+Group2 (nulliparous women >3 weeks gestation with singleton cephalic pregnancies) 2396(48%) followed by Group 3 + Group 4 (multiparous

>37 weeks singleton cephalic without prior cesarean section) 1240(24.8%) (Figure1) Groups 6-9 in total was 221, which was 4.4% of the population. Similarly, Group 5 (Prior cesarean section term singletons) and Group 10 (all preterm cephalic singletons) comprised 631(12.7%) and 497(10 %) of all deliveries in the hospital respectively (Figure1).

In the study, it was observed that Group 2 was 1.3 times larger than Group 1, meaning that the number of induced or elective cesarean section was much higher than the spontaneous initiated labor among the nulliparous women. (Table 2) In contrast, the number of spontaneous labor was 1.3 times higher than the induced or prelabor cesarean section in the multiparous Group (Group3+Group4). The ratio between Groups 6 and 7(1.3:1) remained similar indicating that breech presentations were equal in both nulliparous and multiparous women. (Table2)

The highest contributors to the overall cesarean section rate in our study was Robson Group 2a 786(27.4 %), followed by Group 5 630(22.0%) and group 1 374(13.0%) respectively. These three groups (2a, 5 and 1) contributed to more than 1790(62%) of all Caesarean sections carried out during the study period (Table2).

Size of Robson Group 10 was 497(10%) of the population delivered during the study period, which was twice as high as that recommended by the Robson guidelines. Group 10 was further sub-divided into two groups according to gestation ages 28 to 32 weeks and 33 to 36 weeks. It was found that majority from these groups 431(86.7%) had delivered at 32-36 weeks and the remaining 66(13.2%) at 28 to 32 weeks. A statistical difference in the mode of delivery was seen in between the two subgroups (p=0.017). Delivery by cesarean section was 15% more in gestational age group 32-36 weeks (293) as compared to 28-32 weeks (35). Indication for cesarean section in this group was fetal distress in 124 37.8%, prior cesarean section in 121(33.2%), severe preeclampsia/eclampsia in 26(7.1%), antepartum haemorrhage in

24(6.6%) and severe oligohydramnios in 23(6.3%) and other indications (9%).

The most common indication for cesarean section was fetal compromise 1003 (35%) followed by previous cesarean section 774(27%) (Figure 2). Fetal compromise included meconium stained liquor 364 (36.1%), fetal bradycardia 363 (36%), fetal tachycardia 173(17%), non-reassuring non stress test 65(4%) and fetal Doppler abnormalities 38(3.8%)

On analysing the differences between the onset of labor (spontaneous/induced) and the cesarean section delivery in Groups 1-4, induction of labor almost doubles the risk of having a cesarean delivery, compared to the onset of spontaneous labor. Cesarean section rate is significantly higher in Group 1 compared with Group 3 (p<0.001). The odds of having cesarean section in nulliparous Group 1 is 3.44 (95% CI: 2.69 to 4.40) times

higher compared with multiparous group 3 (Table3).

Similarly, in the induced category, cesarean section rate is significantly higher compared with spontaneous Group (p<0.001). The Odds of having cesarean section in Induced Group (2a+4a) is 1.62 (95% CI: 1.39 to 1.88) times higher compared with spontaneous labouring group (1+3) (Table3). The odds of having cesarean section in group 2a is 4.21 (95% CI:3.34-5.29) times higher compared with group 4a.

The highest number of deliveries occurred during the summer period (28.4%) and the least during the winters (20%) (Table4). In our study, the mode of delivery is found to be significantly different according to the season (p=0.0073). Cesarean section deliveries are found more prevalent during winter (60.5%) and least during fall season (53.8%)

Table 2. The Robson classification report

Group	No of CS in each group	No of women in group	Group size %	Group CS rate %	Absolute group contribution to overall CS rate%	Relative contribution of group to overall CS rate%
1	374	1039	20.84	36	7.5	13.04
2a	786	1149	23.05	68.41	15.77	27.42
2b	208	208	4.17	100.00	4.17	7.25
3	100	712	14.28	14.04	2.01	3.49
4a	156	459	9.21	33.99	3.13	5.44
4b	69	69	1.38	100.00	1.38	2.41
5.1	616	617	12.38	99.84	12.36	21.49
5.2	14	14	0.28	100.00	0.28	0.49
6	78	82	1.64	95.12	1.56	2.72
7	62	62	1.24	100.00	1.24	2.16
8	62	63	1.26	98.41	1.24	2.16
9	14	14	0.28	100.00	0.28	0.49
10	328	497	9.97	66.00	6.58	11.44
Total	2867	4985	100.00	57.51		

Table 3. Comparison of Cesarean Section Rate in Spontaneous Laboring Nulliparous vs. Multiparous Women and Induced vs. Spontaneous Onset of Labor

Variables	Total(n)	CS n (%)	Vaginal delivery n (%)	p value	OR (95% CI)
Robson TGCS GROUP					
1	1039	374 (36)	665 (64)	<0.001	
3	712	100 (14)	612 (86)		
Induced (2A+4A)	1608	942 (58.6)	666 (41.4)	<0.001	1.62 (1.39 - 1.88)
Spontaneous (1+3)	1247	582 (46.7)	665 (53.3)		

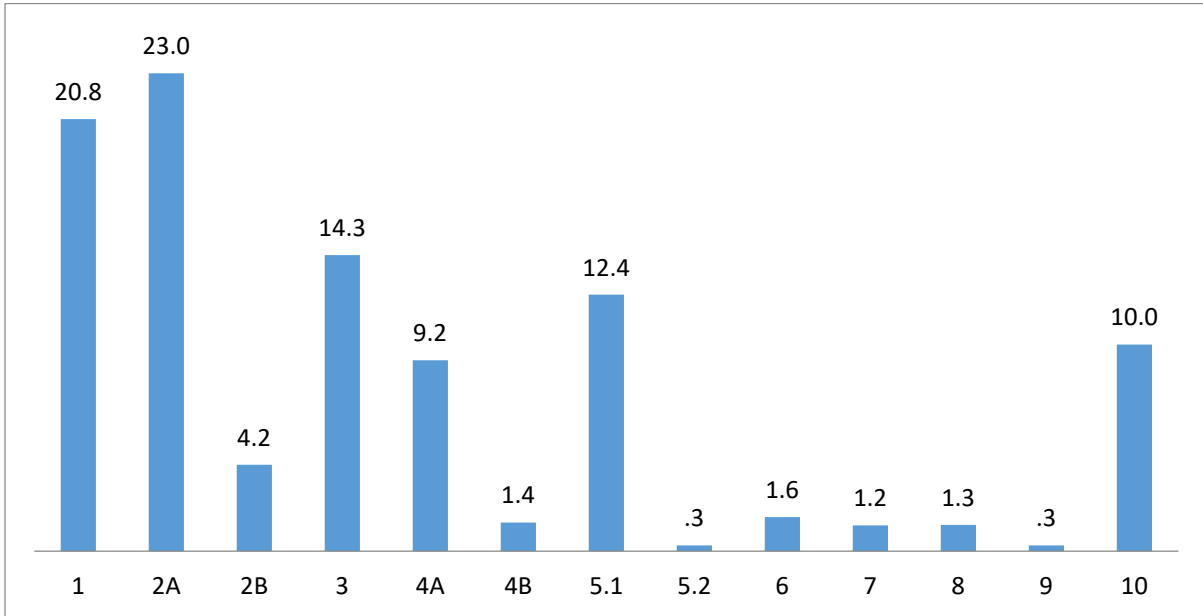


Figure 1. Distribution of Robson ten group classification in percentage.

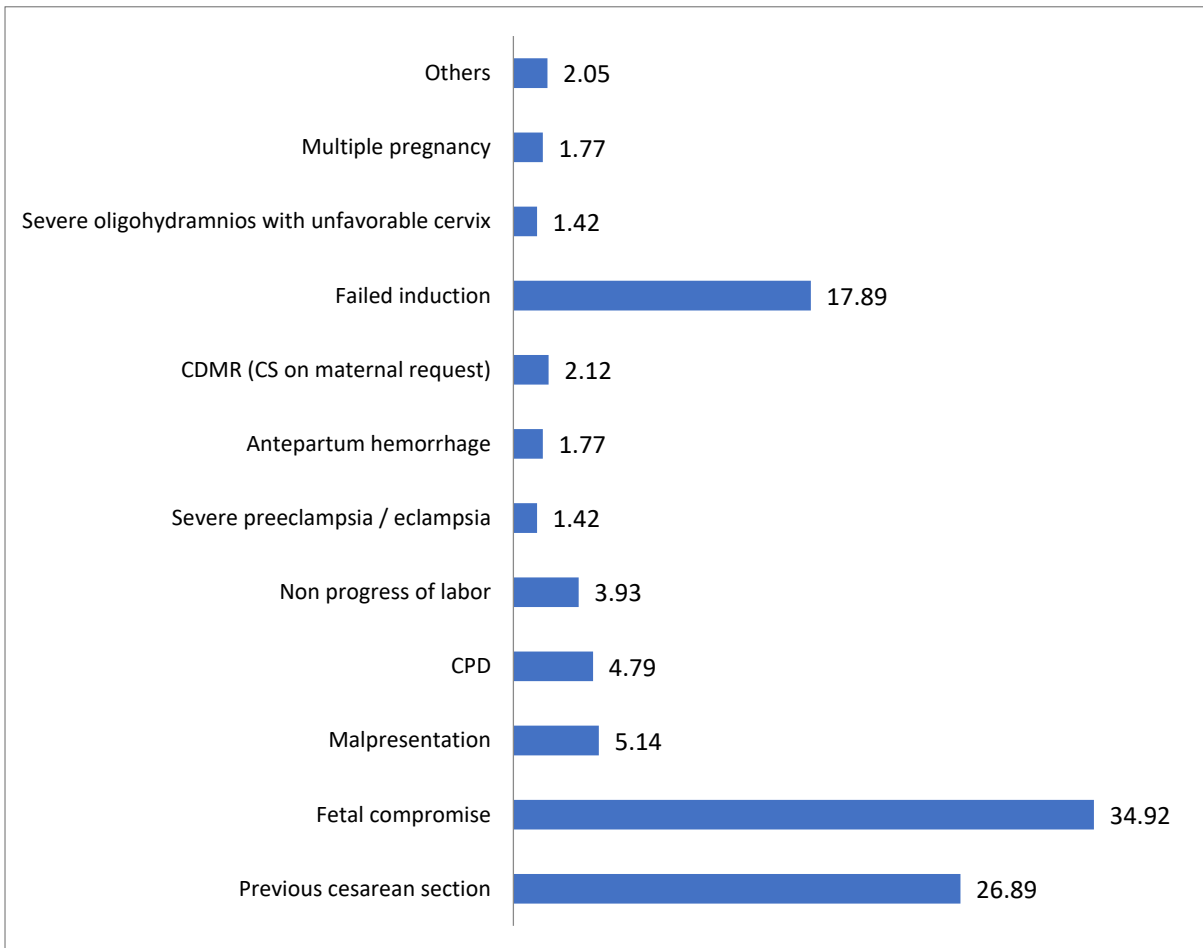


Figure 2. Distribution of Indications for Cesarean Section, N=2878.

Table 4. Seasonal trend of CS pattern

Seasons	Total (n)	Cesarean n(%)	Vaginal delivery n(%)	p value	OR (95% CI)
Spring	1233	718 (58.2)	515 (41.8)	<0.001	1.2 (1.03 - 1.4)
Summer	1417	827 (58.4)	590 (41.6)		1.21 (1.04 - 1.4)
Winter	997	603 (60.5)	394 (39.5)		1.32 (1.11 - 1.55)
Fall	1343	722 (53.8)	621 (46.2)		Reference

Note: Seasons: March-May (Spring), June-August (Summer), September-November (Fall), December-February (Winter)

Discussion

Over the past few years the cesarean section rate has been progressively increasing in our institution and is at an all-time high (57.5%). While this rate is comparable to rates reported in some study, it is considerably higher than in other government hospitals.^{2,8,9}

In our study, Group1+Group2+Group5 combined contributed to 2/3 (60.28%) of all cesarean section, consistent with most other studies.¹⁰

The highest cesarean section rate is among group 2 (34.6%) which comprises of 2a-induced group (n= 786) and 2b-pre-labour group (n=208). We can conclude that the high rate of cesarean section in this group is due to the large size of group 2a indicating poor success rates for induction of labor or poor choice of women to induce. The main indication of cesarean section in this group was failed induction (54%) and fetal distress (35%) during labour.

While, several studies have identified Group 5 as the leading contributor to the cesarean section rate,¹²⁻¹⁴ in this study, it is the second highest contributor. The cause of this high rate in this group is due to our practise of scheduling prelabor cesarean section for all women with a prior cesarean section scar without attempting a trial of labor.

Compared to other studies,¹¹ Group 10 had a far higher cesarean section rate 328(65.71%) in our study. The most common indication for cesarean section in this group was fetal distress (34%) and prior cesarean section (33.2%). The high cesarean section rate in this group can be attributed to large number of high risk pregnancy referrals (such as fetal

growth restrictions, preeclampsia and other pregnancy or medical complications)¹² that usually required preterm cesarean section.

Another crucial finding is of an increased cesarean delivery in induced women compared to women in spontaneous onset of labor, as opposed to many recent studies.¹⁵⁻¹⁷ However, these findings are consistent with other studies which reported a twofold increase in cesarean section following induction of labor in nulliparous women.¹⁸

It is important to note that Induction of labor which is usually done for complications of pregnancy can increase the risk of cesarean section independently. This finding is in contrast to a 2006 Cochrane review which found a moderate but statistically significant reduction in the cesarean section rate in the induced pregnant women.¹⁹ In our study, as opposed to the Cochrane review, the odds of having cesarean section in the Induced group was found to be twofold compared with the spontaneous group. Failed induction was found to be the third highest indication for cesarean section in our study which further validates our findings.

Therefore, there needs to be a more stringent protocol for inducing labor especially among nulliparous women and to practice evidence based guidelines so as to decrease the cesarean section rate. Redefining failed induction needs to be considered critically as well. Previous studies have indicated that by increasing the duration of the latent phase (up to 24 hours or longer) and administration of oxytocin for at least 12–18 hours after membrane rupture can increase the probability for vaginal delivery thereby decreasing the cesarean section rate.²⁰⁻²³

Although Groups 6, 7, 8 and 9 had the highest group cesarean section rate of 95-100%, they did not contribute much to the overall cesarean section rate because of their small size. External cephalic version (ECV) in Group 6, 7 (nulliparous and multiparous breech presentation) and trial of labor in Group 8 (Twins with the presenting twin in cephalic presentation) can be considered to further lower the cesarean section rate in these groups.

Significance of this study: All the women delivering at the center during the study period were included (not just the cesarean sections) leading to a large and complete sample size. The results of this study can serve as baseline data to monitor trends of cesarean section rate over time in our institution, as well as to compare our practice with that of other institutions.

This is a single center study and is not representative at the provincial or National levels. Similarly, there were a few cases of "Unclassifiable" cases (0.01%) resulting from absence of onset of labor and gestation which could not be analysed.

Patan hospital has been using the traditional classification based on indication for cesarean section. Though the audit is conducted monthly, it is not an effective tool to measure trends. Therefore, to address this gap, it is imperative that we immediately start adopting the Robson classification recommended by WHO and the government of Nepal in our department. It will not only ensure that proper monitoring of the cesarean section is being implemented but also contribute to the overall wellbeing of the women that we serve.

Conclusion

The cesarean section rate in Patan hospital has reached a new high and it seems to be increasing unless immediate measures are taken urgently. Results from this study found that Group 1+ Group 2 (the term, single

cephalic nulliparous women) accounted for almost 50% of the study population. In order to effectively reduce the overall cesarean section rate, we need to target our intervention primarily to this group.

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Conflict of Interest

None

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Author Contribution

Concept, design, planning: all; Literature review: all; Data collection/analysis: PG, SM; Draft manuscript: PG; Revision of draft: all; Final manuscript: all; Accountability of the work: all.

Reference

1. Betran AP, Ye J, Moller AB, Souza JP, Zhang J. Trends and projections of caesarean section rates: global and regional estimates. *BMJ Global Health*. 2021;6(6):e005671. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
2. Betran AP, Torloni MR, Zhang JJ, Gulmezoglu AM, WHO Working Group on Caesarean Section. World Health Organization. WHO statement on caesarean section rates. *BJOG*. 2016;123(5):667-70. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
3. Nepal Demographic and Health Survey 2022 - Key Indicators (English) [Internet]. | [Full Text](#) |
4. Ministry of Health and Population (MOHP), Nepal, New ERA, ICF International. Nepal demographic and health survey 2016. Kathmandu: Ministry of Health; 2017. | [Google Scholar](#) | [Full Text](#) |
5. Pradhan B, Shrestha SD, Laxmi RC, Sharma P, Bhandary S. Increasing trend of caesarean section in Patan Hospital. *J Gen Pract Emerg Med Nepal*. 2015;4(6):3-5. | [Google Scholar](#) | [Weblink](#) |

6. World Health Organization Human Reproduction Programme. WHO statement on caesarean section rates. *Reprod Health Matters*. 2015;23(45):149-50. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Weblink](#) |
7. Betran AP, Vindevooghel N, Souza JP, Guelmezoglu AM, Torloni MR. A systematic review of the Robson classification for caesarean section: what works, doesn't work and how to improve it. *PLoS One*. 2014;9(6):e97769. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
8. Robson M, Hartigan L, Murphy M. Methods of achieving and maintaining an appropriate caesarean section rate. *Best Pract Res Clin Obstet Gynaecol*. 2013;27(2):297-308. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
9. World Health Organization. Robson classification: implementation manual (2017). World Health Organization. | [Weblink](#) | [Full Text](#) |
10. Laxmi T, Goma D, Kumariniraula H, Roshnitu T, Binod A. Rising cesarean section rates in Nepal: question of safety and integrity on obstetric emergency practice. *J Gynecol Women Health*. 2017;7(4):555716. | [Google Scholar](#) | [Weblink](#) |
11. Poudel R, Dangal G, Karki A, Pradhan HK, Shrestha R, Bhattachan K, et al. Assessment of caesarean section rates at Kathmandu Model Hospital using the Robson's ten group classification system. *J Nepal Health Res Council*. 2019;17(4):491-4. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
12. Gautam P, Karki C, Adhikari A. Robson's group 2 criteria among total caesarean sections in a tertiary care hospital: a descriptive cross-sectional study. *JNMA J Nepal Med Assoc*. 2021;59(243):1098-1101. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
13. Abubeker FA, Gashawbeza B, Gebre TM, Wondafrash M, Teklu AM, Degu D, et al. 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):1-7. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
14. Costa ML, Cecatti JG, Souza JP, Milanez HM, Gülmezoglu MA. Using a caesarean section classification system based on characteristics of the population as a way of monitoring obstetric practice. *Reprod Health*. 2010;7(1):1-8. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
15. Litorp H, Kidanto HL, 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):107. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
16. Sah S, Goel R, Goel JK. Analysis of caesarean section rate according to Robson's criteria in tertiary care centre. *Int J Reprod Contracept Obstet Gynecol*. 2018;7(8):3060-5. | [Google Scholar](#) | [Weblink](#) |
17. Ehrental DB, Jiang X, Strobino DM. Labor induction and the risk of a cesarean delivery among nulliparous women at term. *Obstet Gynecol*. 2010;116(1):35-42. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
18. Denona B, Foley M, Mahony R, Robson M. Discrimination by parity is a prerequisite for assessing induction of labour outcome - cross-sectional study. *BMC Pregnancy Childbirth*. 2020;20(1):709. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
19. Davey MA, King J. Caesarean section following induction of labour in uncomplicated first births- a population-based cross-sectional analysis of 42,950 births. *BMC Pregnancy Childbirth*. 2016;16(1):92. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
20. Heffner LJ, Elkin E, Fretts RC. Impact of labor induction, gestational age, and maternal age on cesarean delivery rates. *Obstet Gynecol*. 2003;102(2):287-93. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Weblink](#) |
21. Senanayake H, Piccoli M, Valente EP, Businelli C, Mohamed R, Fernando R, et al. Implementation of the WHO manual for Robson classification: an example from Sri Lanka using a local database for developing quality improvement recommendations. *BMJ Open*. 2019;9(2):e027317. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
22. Spong CY, Berghella V, Wenstrom KD, Mercer BM, Saade GR. Preventing the first cesarean delivery: summary of a joint Eunice Kennedy Shriver national institute of child health and human development, society for maternal-fetal medicine, and American college of obstetricians and gynecologists workshop. *Obstet Gynecol*. 2012;120(5):1181-93. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |
23. Caughey AB, Sundaram V, Kaimal AJ, Gienger A, Cheng YW, McDonald KM, et al. Systematic review: elective induction of labor versus expectant management of pregnancy. *Ann Intern Med*. 2009;151(4):252-63. | [DOI](#) | [PubMed](#) | [Google Scholar](#) | [Full Text](#) |