OPERATIVE DELIVERIES AT FULL CERVICAL DILATATION; 'CHOOSING BETWEEN LESSER OF TWO EVILS': A COMPARATIVE STUDY OF MORBIDITIES OF VACUUM DELIVERY AND CAESAREAN SECTION

Aryal S[1], Shrestha D[1], Mahato S[2]*

Affiliation

1. *Assistant Professor, Department of Obsterics and Gynecology, Lumbini Medical College, Pravas, Palpa*
2. *Resident, Department of Obsterics and Gynecology, Lumbini Medical College, Pravas, Palpa*

ARTICLE INFO

Received : 12 July, 2020

Accepted : 22 August, 2020

Published : 05 October, 2020

ORA 184

DOI: https://doi.org/10.3126/bjhs.v5i2.31407

**** Corresponding Author***

Dr. Shreyashi Aryal
Assistant Professor
Department of Obstetrics and Gynecology
Lumbini Medical College and Teaching Hospital, Nepal
Email ID: shreyashiaryal@gmail.com
ORCID ID: https://orcid.org/0000-0002-6832-3530

Citation

Aryal S, Shrestha D, Mahato S. Operative Deliveries at Full Cervical Dilatation; 'Choosing Between Lesser of Two Evils': A Comparative Study of Morbidities of Vacuum Delivery and Caesarean Section. BJHS 2020;5(2)12: 1065-1070.

ABSTRACT

Introduction

Operative delivery at full cervical dilatation can be either a caesarean section or instrumental deliveries. Instrumental deliveries are well debated options for reducing caesarean section rates but they have their own set of maternal and fetal morbidities. CS at full dilatation of cervix is also demanding due to impacted fetal head. Choice between the two depends on the treating obstetrician.

Objective

To assess perinatal morbidities between vacuum delivery and caesarean section at full cervical dilatation.

Methodology

This is an observational cross-sectional comparative study done for the duration of one year from January to December 2019. Women undergoing vacuum delivery or caesarean section in full cervical dilatation were compared for maternal and neonatal morbidities. Risk factors associated with these morbidities were also assessed. The morbidities in each group were compared using Pearson's chi square test. Likelihood of morbidities in relation to risk factors was calculated using univariate logistic regression.

Results

Prevalence of maternal complications in vacuum delivery was 33.3% (28) and in caesarean was 42.9% (15). Neonatal complications in vacuum delivery was 50% (42) and in caesarean was 48.6% (17). Being a referred case (OR=1.14) and a primigravida (OR=1.45) were risk factors for perinatal morbidities in vacuum delivery. Referred cases (OR=1.52), primigravidas (OR=5.90), head station lower than zero (OR=1.26) and birth weight of more than 3500 gms (OR=2.60) were associated with more number of morbidities in caesarean at full cervical dilatation.

Conclusion

Operative deliveries at full cervical dilatation, either vacuum or CS carry risk of maternal and neonatal morbidities. Obstetrician should make a decision keeping in mind certain risk factors like referred cases, parity, head station, number of pulls, method of delivery of head and fetal weight so that severe morbidities can be prevented.

KEY WORDS

caesarean section, full dilatation, morbidities, vacuum delivery

INTRODUCTION

Operative delivery at full cervical dilatation can be either a Caesarean Section (CS) or instrumental deliveries also known as operative vaginal deliveries. Instrumental deliveries, either vacuum or forceps delivery, are well debated options for reducing CS rates with an incidence of 1% of all institutional deliveries in low and middle income countries,[1] but they have their own set of maternal and fetal morbidities like perineal tear, postpartum haemorrhage, (PPH) neonatal trauma and admission to neonatal unit.[2,3] On the other hand, performing CS at full dilatation of cervix is demanding due to impacted fetal head with increased risk of PPH, extension of uterine incision and urinary bladder injury, febrile illness and wound infection.[4-6] Despite these risks, the rate of Caesarean Section at Full Cervical Dilatation (CSFD) has increased from 1 to 5% over the past decades.[5] In conditions where labor progresses upto the second stage but normal delivery seems life threatening to the mother or the baby, choice needs to be made between operative vaginal delivery or CSFD. This is a choice obstetricians have to make between the lesser of two evils.

This study was done with the aim of assessing perinatal morbidities between vacuum delivery (VD) and CSFD.

METHODOLOGY

This is an observational, cross-sectional comparative study done at Lumbini Medical College Teaching Hospital (LMCTH) for the duration of one year from January to December 2019. Ethical approval was taken from the institutional review board, before commencement of the study.

Women with a term (37-42 weeks), singleton pregnancy with cephalic presentation, in second stage of labor, who were decided by the obstetrician on duty to undergo VD or CSFD were enrolled in the study. Women undergoing caesarean section for failed vacuum delivery were excluded from the study. Informed written consent was taken in first stage of labor after explaining to the patient the indication of both methods of delivery and enrollment if they required either of the two. Only VD was included in the study because forceps delivery is less preferred in this institute main reason for this being clinical expertise of the obstetricians with this instrument.

All women underwent labour without epidural analgesia. Vacuum deliveries were conducted using Silastic cups of different sizes and episiotomy was given during crowning as deemed necessary. All VD and CSFD were conducted by an Obstetrician. Failed vacuum delivery was considered when there was no or minimal descent of fetal head after three pulls or after 30 minutes of the first vacuum application or there was non-reassuring fetal status during the procedure. These cases were taken for CS and were excluded from the study. All women were followed prospectively until discharge from hospital.

A pre designed proforma was filled for each woman. Indication for vacuum or CS were noted along with duration of second stage, head station and position, number of pulls. Method of delivery of head in CSFD were divided into four groups, by vertex, by reverse breech extraction, by push method or abdomino-vaginal method that is pushing the fetal head through the vagina and Patwardhan method where the infants' shoulders are delivered first, then the trunk, breech, limbs then finally the head.

Maternal morbidities that were assessed were: PPH, third degree perineal tear, cervical tear, extended uterine incision, febrile illness, blood transfusion, surgical site infection, duration of catheterization and length of stay in the hospital. PPH was defined as a visual estimation of blood loss more than 500 ml in vacuum delivery and 1000ml in CS.

Neonatal morbidities that were taken into account were: admission to special care baby unit, neonatal trauma like bruising, scalp and facial lacerations, cephalhematoma, cerebral hemorrhage and brachial plexus injury, Apgar scores, sepsis and neurological complications like meningitis, seizures and neonatal encephalopathy.

Specific factors which might play a role in increasing morbidities like parity, referred cases, duration of second stage of labor, head station, number of pulls during VD, method of delivery of head in CSFD and birth weight were also assessed.

Sample size:

Sample size was calculated with the formula:

$$n > \frac{[Z_{1-A/2}](r+1)\, p\,(1-p) + Z_{1-B}\; rp1\,(1-p1) + p2\,(1-p2)]}{r(p2-p1)^2}$$

where $p = p1+rp2/1+r$

alpha A = 0.05, beta B = 0.2, P1= .173, p2= .5245

It was calculated based on maternal morbidity rates of VD and CS in previous studies [3,4] using the formula for comparative studies as below.

So the minimum sample size in each group was 28.

Statistical analysis

Data was entered in Microsoft Excel and analyzed using SPSS version 16.0.

The morbidities in each group was compared using Pearson's chi square test and paired t-test with a p value <0.05 as significant.

Likelihood of morbidities in relation to various factors during the delivery was calculated using univariate logistic regression and results expressed as Odds Ratio and 95% confidence interval.

Results

During the study period there were 2616 total deliveries. Out of which, instrumental deliveries were 88. VD were 86 giving an incidence of 3.28%. Eighty four cases met the inclusion criteria and were included in the study. (Fig 1)

Total CS during the study period was 778 out of which 49 were done in second stage of labour out of which 35 cases meeting the inclusion criteria were enrolled in the study. (Fig 1). Incidence of CSFD was 1.83% among all deliveries and 0.06% among all CS.

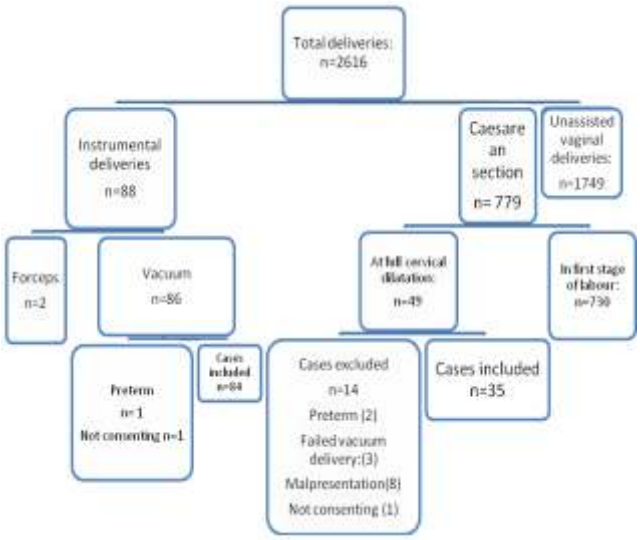

Figure 1: Patient enrollment process for operative delivery at full cervical dilatation

The mean (SD) age of patients of vacuum delivery were 22.14 (2.23) years and CSFD were 23.34 (3.03) years. Mean gestational age for vacuum delivery was 39.76 (1.13) weeks and CS was 39.34 (1.13) weeks. In the group of VD, 54(64.3%) were primigravida and other were multigravida. Whereas in CS group, primigravida were 22 (62.9%) and multigravida were 13 (37.1%).

Fifty percent (42) and 48.6% (17) cases were referred from other centers in VD and CSFD group respectively. Mean (SD) duration of second stage in VD was 101.37 (70.91) minutes and for CSFD was 168.86 (46.00) minutes. Commonest indication for vacuum delivery was prolonged second stage in 36 (42.85%) followed by non reassuring fetal status in 17 (20.23%). For CSFD, cephalopelvic disproportion (CPD) was the main indication in 9(25.7%) patients, all the rest 26 (74.3%) had prolonged second stage coexisting with CPD, non reassuring fetal status or meconium stained liqour.

Rate of maternal complications in VD was 33.3% (28) and in CSFD was 42.9% (15). Rate of neonatal complications in VD was 50% (42) and in CSFD was 48.6% (17). Maternal morbidities was compared in both the groups. Table 1 shows that the number of blood transfusions were more in CSFD group (X= 6.509, df= 1 p=.011) and duration of catheterization and hospital stay was more in the same group (p=0.000).

Table 1: Maternal morbidities in both the groups

Complication	Vacuum delivery n=84	CSFD n=35	p value
Total Morbidities n(%) Present Absent	 32 (38.1) 52 (61.9)	 17 (48.6) 18 (51.4)	 0.290
PPH n(%) Present Absent	 15 (46.8) 69(52.2)	 8 (22.9) 27 (77.1)	 0.529
Third/fourth degree Perineal tear n(%)	6(7.2)	0	
Cervical tear n(%)	3 (3.6)	0	
Extended uterine incision n(%)	0	6 (17.1)	
Febrile illness n(%) Present Absent	 5(15.6) 79(84.4)	 2(5.7) 33(94.3)	 0.960*
Blood transfusion n(%) Present Absent	 3 (3.6) 81 (96.4)	 6 (17.1) 29(82.9)	 0.011*
Surgical site infection n(%) Present Absent	 2(2.4)	 2(5.7)	 0.889
Duration of catheterization (Mean (SD)	0.48 (0.98)	2.54 (1.14)	0.000**
Hospital stay in days (Mean (SD)	2.01 (1.19)	5.37(0.73)	0.000**

*Fisher exact, ** paired t test

Table 2 shows that neonatal sepsis was the only neonatal morbidity which was significantly higher in CSFD group (X= 5.877, df=1, p=0.026). Hypoxic ischemic encephalopahy was seen in significant number of neonates in the vacuum group (X=0.000, df=1, p=0.000).

Table 2: Neonatal morbidities in both the groups

Complication	Vacuum delivery (n=84)	CSFD (n=35)	p value
Total morbidities n(%) Present Absent	 42 (50) 42 (50)	 17 (48.6) 18 (51.4)	 0.887
Admission to special care baby unit n(%) Required Not required	 45 (53.6) 39 (46.4)	 24 (68.6) 11 (31.4)	 0.156
Apgar Score at one minute of birth Mean SD	6.44(2.10)	7.68 (1.32)	0.009
Neonatal trauma n(%) Absent Present -bruising, -scalp and facial lacerations -cephalhematoma -cerebral hemorrhage -brachial plexus injury	 60 (83.3) 14 (16.7) 0 0 10 2 2	 32 (91.5) 3 (8.5) 3 	 0.389*
Sepsis n(%) Present Absent	 6 (7.1) 78 (92.9)	 8 (2.3) 27 (97.7)	 0.026
Meconium aspiration syndrome n(%) Present Absent	 16 (19.04) 68 (80.96)	 3 (8.5) 32 (91.5)	 0.155*
Neurological complications Absent Present -meningitis -HIE and or seizures n(%)	 72 (85.8) 0 12 (14.2)	 30(85.7) 0 5 (14.3)	 0.000
Asphyxia/respiratory distress n(%) Present Absent	 12 (14.3) 72 (85.7)	 9 (25.7) 26 (74.3)	 1.136
Mechanical ventilation Required Not required	 6 (7.1) 78 (92.9)	 2(5.7) 33(94.3)	 0.777

*Fisher exact
**HIE: Hypoxic ischemic encephalopathy

There were no neonatal deaths or still births in either of the groups. The commonest indication for VD and CSFD both was prolonged second stage of labour seen in 41(48.8%) and 26 (74.2%) cases respectively.

Total 80 (67.2%) cases had either maternal or neonatal morbidities, 58 cases in VD and 22 in CSFD. Table 3 shows the odds of having these morbidities in relation to various antepartum and intrapartum factors. Being a primigravida (OR=1.45) was the only risk factors for having maternal or neonatal morbidity in VDs.

Table 3: Socio demographic characteristics of the women n=60

Factors	N=58 (morbidities)	P value	OR	95% CI
Referred Yes No	 31 27	.345	1.148	.860-1.53
Gravida 1 >1	 42 16	.020	1.458	1.014-8.017
Duration of second stage <180 minutes >180 minutes	 52 6	.870	1.040	.640-1.691
Head station 0 or higher Lower than 0	 8 50	.777	1.062	.716-1.574
Position Occipito anterior Occipito transverse/posterior	 43 15	.358	.896	.660-1.216
Number of pulls ≤2 >2	 30 28	.001	0.627	.482-.815
Birth weight ≤3500 >3500	 51 7	.066	.927	.565-1.521

Referred cases (OR=1.52), primigravidas (OR=5.90), head station higher than zero (OR=1.26) and birth weight of more than 3500 gms (OR=2.60) were associated with more number of morbidities in CS at full cervical dilatation.(Table 4)

Table 4 : Factors associated with maternal or neonatal morbidities in CSFD

Factors	Morbidities N=22	P value	OR	95% CI
Referred Yes No	 13 9	0.102	1.529	.898-2.603
Gravida 1 >1	 20 2	0.000	5.909	1.640-21.289
Duration of second stage <180 minutes >180 minutes	 12 10	0.022	.550	.345-.855
Head station Lower than 0 0 or higher	 16 6	.355	1.266	.762-2.103
Position Occipito anterior Occipito transverse/posterior	 9 13	.587	1.038	.21-1.732
Birth weight (gms) >3500 ≤3500	 18 4	0.002	2.609	1.154 -5.897

Maternal or neonatal morbidities were calculated as per the method of delivery of head. Twenty (57.1%) cases were delivered by vertex out of which 11 (55%) developed morbidities. Seven cases (20%) were delivered by breech extraction out of which six (85.7%) had morbidities. Abdomino-vaginal or push method was used in 5(14.2%) patients out of which two (40%) had morbidities. Partwardhan method was used in 3(8.57%) and all had morbidities.

DISCUSSION

Operative deliveries at second stage of labour carry risk of maternal and neonatal morbidities. VD is associated with less pain and early recovery than CSFD[7] yet the trend of CSFD is increasing.[4,8] This could be due to lack of expertise in VD and its associated morbidities. On the other hand CSFD carries its own set of morbidities like PPH, blood transfusion and visceral injuries.[9,10] Increasing medicolegal problems have limited free decision making of an obstetrician to perform any operative deliveries as per their experience or preference.

The findings of this study suggest that the rate of maternal and neonatal morbidity is high in CSFD compared to VD. A study by Radha P et al showed no significant difference in morbidities between VD and CS in first and second stage of labour.[11] The findings of our study is consistent with the findings of Nolens B et al where maternal morbidity was 0.8% in VD and 4.2% in CS.[12] The same study shows that blood loss of at least 500 ml was more in CS group but women who had blood loss of at least 1000 mL was the same as in our study. Also the number of blood transfusions did not differ (*P*>0.99).Rates of PPH in different studies for CSFDwere 10.1%[13] 4.8%[14], 2.7%.[11] Rate of blood transfusion has been shown to be 8.3% in CSFD in a study by G Davis et al.[13] Our study shows increased rate of PPH (46.87%) in VD but increased number of blood transfusion in CSFD (17.1%). This is because visual estimation of blood loss of more than 500 ml in VD and 1000ml in CS was considered as PPH so more the blood loss more will be the chances of blood transfusion. This hospital is set up in a hilly area where women cannot come for follow up regularly so we have a low threshold for blood transfusion. Also the compliance for oral iron therapy is not good. All these factors lead to a increase in blood transfusion rate.

In our study mean hospital stay was more than five days in CS group and less than 2 days in VD. This finding is consistent with the findings of another study in Uganda where hospital stay was shortened after vacuum extraction and a hospital stay longer than five days was more common in the CS group (p=0.001).[12]

CS in full cervical dilatation carry risks of wound infection, hysterectomy or relaparotomy.[12,14] Our study showed equal incidence of surgical site infection in both the groups but there were no incidence of re-laparotomy and hysterectomy during the study period. A study in Singapore shows that maternal blood loss is higher in instrumental deliveries but neonatal morbidity is similar to CSFD[15]

This study shows that overall neonatal morbidity is not significantly different in the two groups but birth asphyxia and seizures are serious neonatal morbidities which are

higher in vacuum deliveries. NICU admission rate was 68.57% in CS. Other studies show a rate of 3.4 to 14.3% [13,14]. High rates of NICU admission in this study could be due to delayed presentations to the hospital from referral sites. A study by Nolens B et al showed no difference in severe perinatal outcome in both the groups.[12] Murphy et al. showed higher rate of admissions to special care baby unit was seen following completed instrumental delivery (aOR 4.5, 95% CI 0.7, 31.4)compared to caesarean section.[16]

Studies have shown fresh still birth rate of 0.6 - 11%.[12,14] in caesarean section and 8.4% in VD.[12] Our study has no neonatal mortality. The reason for this is because late neonatal deaths are not detected because of loss of follow up. Many neonates are taken home against medical advice due to reasons like non-affordability and other social factors and cannot be followed up.

This study has analyzed the risk factors causing morbidities during operative deliveries in second stage of labour. It is seen that referred cases had more odds of having maternal and perinatal morbidities in both modes of deliveries. A study by Nolens B showed no difference (p=0.139) in morbidities between referred cases and others.[12]

Being a referred case (OR=1.14) and being a primigravida (OR=1.45) was associated with increased morbidities in VD. Maruka GM et al shows high perinatal morbidity and mortality in mid cavity vacuum use that is when the head station is higher than 2cms from the ischial spine.[17] Murphy DJ et al showed that more than three pulls at attempted instrumental delivery was associated with increased neonatal trauma. (aOR 4.2, 95% CI 1.6, 9.5)[16]. Radha P et al showed that duration of second stage did not affect morbidities in CSFD which is similar to the findings of our study.[11]

The findings of this study shows that referred cases (OR=1.52), primigravidas (OR=5.90), head station lower than zero (OR=1.26) and birth weight of more than 3500 gms (OR=2.60) were associated with more number of morbidities in CSFD. In consideration of statistically non significant differences in morbidities in both the groups, women with these risk factors can be planned for VD in absence of other contraindications.

This study showed that delivery of baby by breech extraction during CS was associated with increased morbidities (85.7%). A systematic review by Waterfall H et al showed that there was no difference between reverse breech extraction and head push for the outcome of birth trauma.[18]

Limitation of this study is its observational design. This study also includes prophylactic application of vacuum to cut short second stage of labour. This would be a bias as these type of vacuum deliveries have better outcome in terms of morbidities. All deliveries were conducted by Obstetricians well versed with both VD and CS in second stage and not by residents so the expertise of the operator was not an issue related to morbidities. Strength of this study is its hospital based design which can be generalized to most teaching hospitals in the country with similar facilities.

In current medical practice where patient's choice is a key factor to decide the mode of delivery, obstetricians need to consider this as well. Study in Uganda shows that women on first day of delivery recommend vacuum delivery from their experiences due to assumption of better maternal outcome and shorter recovery period.[7] There is a need of further studies to formulate recommendations based on womens' preferences.

With worldwide concerns of increasing CS rate and difficult obstetric outcome for repeat CS we have to limit CS rate. The findings of this study suggest increased severe neonatal morbidities for VD but similar rate of morbidities in both modes of delivery. Thus which mode of delivery is a better choice remains a dilemma. At present, there are no randomized controlled trials and therefore no definite guidelines based on which an obstetrician can make a decision. Guidelines by the Society of Obstetrician and Gynecologists of Canada recommend that the need of VD or CSFD has to be individualized as effectiveness of one over other is not established.[19] Based on the experience of individual institutes and operators, certain risk factors associated with perinatal morbidities like parity, head station, number of pulls, method of delivery of head and fetal weight should be kept in mind before making a choice on the mode of delivery at full cervical dilatation. In tertiary health care facilities, where cases are referred from primary health care centers in rural Nepal, CSFD seems to be a preferred choice based on the findings of this study.

RECOMMENDATION

Further research on long term maternal outcome and neuro development of infants in both these modes of delivery is warranted. Also comparison of newer modalities of operative vaginal deliveries like fetal pillow and fetal disimpacting system with CSFD can be done leaving obstetricians with more options with possibly better perinatal outcome.

LIMITATIONS OF THE STUDY

This study has been done with a small size so the findings have to be confirmed with randomized controlled trials.

CONCLUSION

Mode of operative deliveries at full cervical dilatation either vacuum or CS carry risk of maternal and neonatal morbidities. CSFD carries risk of maternal morbidity like high rate of blood transfusion whereas VD is seen to cause more incidence of hypoxic ischemic encephalopathy in neonates. Obstetrician should make a decision keeping in mind certain risk factors like referred cases, parity, head station, number of pulls, method of delivery of head and fetal weight so that

severe morbidities can be prevented. Though the mode of delivery at full cervical dilatation has to be individualized, formulation of national guidelines based of morbidity and mortality rate would help obstetricians deal with this dilemma.

ACKNOWLEDGEMENT

We would like to thank our resident doctors and Paediatrics department for their support.

CONFLICT OF INTEREST

None

REFERENCES

1) Bailey, PE, van Roosmalen, J, Mola, G, Evans, C, de Bernis, L, Dao, B. Assisted vaginal delivery in low and middle income countries: an overview. BJOG 2017; 124: 1335– 1344. https://doi.org/10.1111/1471-0528.14526.
2) Singh A, Rathore P. A comparative study of feto-maternal outcome in instrumental vaginal delivery. J Obstet Gynaecol India 2011; 61: 663–6. DOI 10.1007/s13224-011-0119-3
3) Shrestha BK, Shrestha S, Thapa B. Vacuum assisted vaginal delivery in singleton term pregnancies: short term maternal and neonatal outcome in a tertiary hospital of Nepal. J. Lumbini Med. Coll. 2016;4(2):104-7. DOI: 10.22502/jlmc.v4i2.101.
4) Babre VM, Bendre KR, Niyogi G. Review of caesarean sections at full dilatation. Int J Reprod Contracept Obstet Gynecol 2017;6:2491-3. DOI: http://dx.doi.org/10.18203/2320-1770.ijrcog20172337
5) Nicola Vousden, Zillah Cargill, Annette Briley, Graham Tydeman, Andrew H Shennan. Caesarean section at full dilatation: incidence, impact and current management. The Obstetrician & Gynaecologist. 2014;16:199–205, DOI: 10.1111/tog.12112
6) Chopra S.Disengagement of the Deeply Engaged Fetal Head during Cesarean Section-Conventional Method versus Reverse Breech Extraction- Review of Literature. Clinics Mother Child Health. 2016; 13:239. DOI:10.4172/2090-7214.1000239
7) Nolens B, Women's recommendations: vacuum extraction or caesarean section for prolonged second stage of labour, a prospective cohort study in Uganda. Trop Med Int Health. 2019 May;24(5):553-562. DOI: 10.1111/tmi.13222. Epub 2019 Mar 27.
8) Unterscheider J, McMenamin M, Cullinane F. Rising rates of caserean deliveries at full cervical dilatation: A concerning trend. Eur J Obstet Gynaecol reprod boil. 2011;157;141-4.DOI: 10.1016/j.ejogrb.2011.03.008.
9) Alexander JM, Leveno KJ, Rouse DJ et al. Comparison of maternal and infant outcomes from primary caesarean delivery during the second compared with the first stage of labor. Obstet Gynecol. 2007; 109 (4): 917–921. DOI: 10.1097/01.AOG.0000257121.56126.fe
10) Selo-Ojeme D, Sathiyathasan S, Fayyaz M. Caesarean delivery at full cervical dilatation versus caesarean delivery in the first stage of labour: comparison of maternal and perinatal morbidity. Arch Gynecol Obstet. 2008; 278 (3): 245– 249. DOI: 10.1007/s00404-007-0548-5.
11) Rhadha P, Tagore S, Rahman MFA, Tee J. Maternal and perinatal morbidity after caesarean delivery at full cervical dilatation. Singapore Med J. 2012; 53(10): 655. PMID: 23112016
12) Nolens B, Namiiro F, Lule J, Van Den Akker T, Van Roosmalen J, Byamugisha J. Prospective cohort study comparing outcomes between vacuum extraction and second-stage cesarean delivery at a Ugandan tertiary referral hospital. Int J Gynecol Obstet. 2018; 142:28–36. DOI: 10.1002/ijgo.12500
13) Davis G, Fleming T, Ford K, Mouawad MR, Ludlow J. Caesarean section at full cervical dilatation. Aust N Z J Obstet Gynaecol. 2015;55(6):565-71.DOI: 10.1111/ajo.12374
14) Gurung P, Malla S, Lama S, Malla A, Singh A. Caesarean section during second stage of labor in a tertiary centre. J Nepal Health Res Counc. 2017;15(36):178-81. DOI:https://doi.org/10.3126/jnhrc.v 15i2.18210
15) Tan PS, Tan JFH, Tan EL, Tan L. Comparison of Caesarean sections and instrumental deliveries at full cervical dilatation: a retrospective review. Singapore Med J. 2019; 60: 75–79. DOI: 10.11622/smedj.2018040
16) Murphy DJ, Liebling RE, Patel R, Verity L, Swingler R. Cohort study of operative delivery in the second stage of labour and standard of obstetric care. Br J Obset Gynaecol. 2003; 110: 610–15. DOI: 10.1046/j.1471-0528.2003.01463.x
17) Muraca GM, Skoll A, Lisonkova S, Sabr Y, Brant R, Cundiff GW, Joseph KS. Perinatal and maternal morbidity and mortality among term singletons following midcavity operative vaginal delivery versus caesarean delivery. BJOG 2018;125:693–702. DOI: 10.1111/1471-0528.14820
18) Waterfall H, Grivell RM, Dodd JM. Techniques for assisting difficult delivery at caesarean section. Cochrane Database Syst Rev 2016;2016: CD004944. DOI: 10.1002/14651858.CD004944.pub3.
19) Cargill YM, MacKinnon CJ. SOCG clinical practice guideline No. 148-Guidelines for operative vaginal birth. J Obstet Gynaecol Can 2018;40:e74–80. Available from https://www.jogc.com/ article/S1701-2163(16)30647-8/pdf