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Effect of Enhanced Recovery after Surgery (ERAS) Protocol on Maternal Outcomes Following Caesarean Delivery

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Abstract

Background: Caesarean Section is a commonly performed surgical procedure in obstetric practice, with its incidence rising every year. This increase has led to higher bed occupancy and cost burdens. Conventional Caesarean Sections have several drawbacks, including patients being kept nil per oral overnight before surgery and for 12-24 hours after surgery, immobilization for up to 24 hours or more, continuation of catheter use for 24 hours or more, and the use of opioid-based anesthetics. To address these issues, Enhanced Recovery after Surgery (ERAS) has been introduced. ERAS consists of multimodal pathways during the pre-, intra-, and post-operative periods. Numerous clinical trials, systematic reviews, and meta-analyses have shown that applying ERAS in Caesarean delivery reduces the length of hospital stay, decreases the use of opioid-based anesthetics, improves patient satisfaction, reduces post-operative pain scores, and increases compliance with breastfeeding. Objectives: To determine the outcome of Enhanced Recovery after Surgery (ERAS) pathway in Caesarean Delivery. ***Methodology:*** This was a prospective observational study conducted at Paropakar Maternity and Women's Hospital. Total duration of study period was 3 months from July 2024 to September 2024. A total of 106 patients meeting the inclusion criteria were included in the study. Those receiving care as per the ERAS protocols and standard conventional protocols were observed throughout pre, intra and post-operative period. The two groups were compared in terms of demographic characteristics, intravenous fluid requirement, duration of surgery, length of hospital stay, post-operative pain scores and other post-operative characteristics such as nausea, vomiting, headache, urinary retention, hospital readmission and neonatal outcome. ***Results:*** Total of 106 patients were included in the study with 53 in each of ERAS and SC group. In this study, there was no statistical difference in age group, Body Mass Index (BMI), co morbid conditions, gravidity, duration of gestation, indication of CS, duration of surgery and estimated blood loss. The average amount of intravenous fluid required intra operatively in ERAS group was 1350 ml and in SC group was 1650 ml with difference of 300 which was statistically significant, $p < .001$. The mean length of post-operative hospital stay was 54 hrs. in ERAS group and 71 hrs. in SC group with difference of 17 hrs. which was statistically significant with $p = 0.023$. The mean post-operative score in ERAS group on Day 0, Day 1 and Day 2 were lower than in SC group with p value $< .001$. There was no significant difference in post-operative complications between two groups. ***Conclusion:*** This study showed that implementation of ERAS protocol is associated with decrease in intra operative fluid requirement, decrease in post-operative length of hospital stay and is associated with significant difference in post-operative pain with use of multi modal analgesia. ERAS can be implemented in Caesarean delivery for addressing the issues of prolonged immobilization, delayed discharge, increased bed occupancy and many more issues associated with it.

Keywords: Placenta praevia, Uterine scar, Caesarean section, Maternal morbidity, Obstetric hemorrhage, Placental adhesion.

INTRODUCTION

Caesarean Delivery (CD) defines the birth of fetus by laparotomy and then hysterotomy [1]. The procedure is elective or emergency depending upon the urgency of the procedure and classical or lower segment cesarean section, depending upon the incision on uterine wall.

Caesarean Section is the most common major abdominal surgery in the world and women, however

face dual challenges after CD being both post -partum and post-operative [2].

With this increasing trend in Caesarean section there has been an increased burden in antenatal and postnatal units of health facilities and also the economic burden over the patient and health facility has increased. Traditionally women who were planned for Caesarean Section were kept fasting overnight before the day of surgery and nil per oral for the first 24 hours of surgery. All patients had prolonged immobilization, longer urinary catheter placement after surgery along with intramuscular analgesics [3]. These practices have led to prolonged hospital stay of patients along with increased cost, postoperative infections and reduced quality of life.

To overcome all these drawbacks of conventional Caesarean Section, Enhanced Recovery after Surgery (ERAS) has been developed which aims to reduce perioperative stress and organ dysfunction by targeting factors that delay postoperative recovery such as surgical induced stress, gastrointestinal function, pain and immobility via multi-modal intervention during pre, intra and postoperative periods [4,5].

Application of ERAS protocol has proved in decreasing the total length of hospital stay after surgery (LOS) by 30% to 50%, reduction in the occurrence of postoperative complication and promoting patients rehabilitation after surgery [6].

NICE Guidelines also recommend that "women who are recovering well, are apyrexial and do not have complications following caesarean section should be offered early discharge (after 24 hour) from hospital and follow up at home, because this is not associated with more infant or maternal readmission [7].

The ERAS committee has produced evidence-based guidance for perioperative care in Caesarean Delivery. It covers practices from the time of decision making for Caesarean delivery to hospital discharge. It includes a maternal focused pathway for both scheduled and unscheduled surgeries. Key Elements of ERAS protocols include preoperative patient optimization and perioperative procedures [8].

This study aims to determine the benefits of implementing Enhanced Recovery after Surgery (ERAS) protocols in Caesarean Delivery.

Study design

This prospective observational study was conducted at Paropakar Maternity and Women's Hospital (PMWH), Thapathali, Kathmandu, Nepal. The data collection spanned three months, from July 2024 to September 2024. The study received approval from the Institutional Review Committee of Paropakar Maternity and Women's Hospital, under Reference No: 64/1912.

Inclusion criteria

Pregnant women with gestational age of 37 0/7 completed or greater based on LMP or ultrasound if LMP is unknown undergoing elective caesarean delivery.

Exclusion criteria

The study excluded patients who were receiving general anesthesia, those with physical disabilities that might restrict postoperative mobilization, and patients diagnosed with mental illness. Additionally, it did not include patients with a Body Mass Index (BMI) of 35 kg/m² or higher, maternal comorbidities such as overt diabetes mellitus and pregnancy-induced hypertension (requiring two or more medications or involving eclampsia), or those experiencing significant intraoperative complications, including postpartum hemorrhage (PPH) greater than 1500 ml, or iatrogenic injuries to the bowel, bladder, or ureter. Patients with renal impairment, peptic ulcer diseases, or known hypersensitivity to Ketorolac were also excluded from the study.

Sample size

Target sample was obtained with the formula:
N = required sample size
SD=standard deviation from reference study
=1.96 at type I error of 5%
=1.28 at 90% power
d=effect size=difference between mean=considering 10 hrs difference between two groups
SD from our reference study =15 [9].
Using the formula mentioned above:
N=47.2~48
The sample size in each group was 48, so the total sample size was 96
Considering 10% drop out, the target sample size was 53 in each group. The total sample size was 106.

RESULTS

Table 1: Patient demographic and clinical characteristics

Patient characteristics	ERAS (n=53)	SC (n=53)	P value
Age (in years) mean ± SD	28.58 ±4.95	29.74 ± 5.23	0.244*
BMI (kg/m²) mean ±SD	29.10 ± 3.84	28.53 ±3.78	0.443*
Maternal co morbidities			
Diabetes Mellitus	3 (5.7%)	4(7.5%)	1†
Hypertensive disorders of pregnancy	3 (5.7%)	3 (5.7%)	1†
Others	6 (11.3%)	4 (7.5%)	0.741†
None	41 (77.4%)	42(79.4%)	0.814‡

* Independent t test, † Fisher Exact test, ‡ Chi square test

The mean age in ERAS group is (mean + SD) 28.58 + 4.95 years and 29.57 + 5.28 years in Standard care with no significant difference, p = 0.244.

Mean BMI in ERAS is (mean + SD) 29.10 + 3.84 kg/m2and 28.53 + 3.78 kg/m2in SC group with no significant difference in two groups, p = 0.443.

Regarding maternal co morbid conditions 41 (77.4%) patients in ERAS group and 42 (79.4%) in SC group had no any co morbid conditions. 3 (5.7%) patients in ERAS group and 4 (7.5%) in SC group had Diabetes Mellitus. 3 (5.7%) patients in each of ERAS and SC group had Hypertensive disorders of pregnancy. In regard to other co morbidities 5 patients in ERAS group had hypothyroidism, 1 patient had asthma and 4 patients in SC group had hypothyroidism.

Table 2: Pregnancy Characteristics

Pregnancy Characteristics	ERAS (n=53)	SC (n=53)	P value
Gravida (n) Primi Multi	 14 (26.4 %) 39 (73.6%)	 7 (13.2%) 46 (86.8%)	0.088‡
Duration of gestation (mean ± SD)	38.93 ± 0.87	38.8 ± 0.86	0.441*
Indication of CS [n (%)]			
Prior 1 CS	35 (66%)	36 (67.9%)	0.836‡
Prior ≥ 1 CS	1 (1.9%)	3 (5.7%)	0.618†
Malpresentation	5 (9.4%)	8 (15.1%)	0.374‡
Suspected Macrosomia	1 (1.9%)	1 (1.9%)	1†
Multiple Gestation	2 (3.8%)	0	0.495†
Active HSV	1 (1.9%)	0	1†
Primary elective	5 (9.4%)	3 (5.7%)	0.716†
Others	3 (5.7%)	2 (5.7%)	1†

* Independent t test, † Fisher Exact test, ‡ Chi square test

Out of 53 patients in ERAS group, 14 patients were primi gravida, 39 were multi gravida. In standard care group 7 were primi and 46 were multigravida with no significant difference in parity (p = .08).

Mean duration of gestation in ERAS group was (mean ± SD) 38.93 ± 0.87 weeks and 38.8 ± 0.86 in SC group with no significant difference, p = 0.445.

Regarding indication of CS in ERAS group, indication was prior 1 CS in 35 (66%) patients, prior 2 CS in 1 patient, malpresentation in 5 (9.45%) patients, suspected macrosomia in 1, multiple gestation in 2 (3.8%), active HSV in 1, primary elective in 5 (9.4%) and others in 3 (5.7%). In SC group, 36 (67.9%) patients underwent CS for prior 1 CS, 3 (5.7%) for prior 2 CS, 8 (15.1%) for malpresentation, 1 for macrosomia, 3 (5.7%) were primary elective and 2 (3.8%) for other indications.

Table 3: Surgical Characteristics

Surgical Characteristics	ERAS (n=53)	SC (n=53)	P value
Duration of surgery (minutes) Mean ± SD	43.67 ± 11	47.54 ± 12	0.087*
Intra operative fluid volume (ml)	1350 ± 185.407	1650 ± 384.109	< .001*
Estimated Blood loss (ml)	322.64 ± 82	336.42 ± 132	0.52*
Blood transfusion	0	0	

* Independent t test

Duration of surgery in ERAS group was 43.67 +SD11 min and in SC group was 47.54 +SD 12 min which was not statistically significant with p = 0.087.

Mean intraoperative fluid volume in ERAS group was 1350 ml and in SC group was 1650 ml which is statistically significant with p < .001.

Mean estimated blood loss in ERAS group was 322.64 ml and in SC group was 336.42 with p = 0.52.

Table 4: Post-operative complications

Post-operative complications	ERAS (n=53)	SC (n=53)	P value
Post-operative nausea & vomiting	1	1	1.0†
Headache	0	0	-
Fever	0	0	-
Urinary Retention	0	0	-
PPH	2	2	1.0†
Hospital readmission	0	0	-

† Fisher Exact test

Out of 53 patients in ERAS group, 1 patient had post-operative nausea and vomiting, 2 patients had PPH, no patients had headache, fever or urinary retention. In SC group also 1 patient had post-operative nausea and vomiting with 2 cases of PPH with no other complications. There were no cases of hospital readmission in both groups.

Table 5: Hospital stay if more than 3 days

Hospital stay if more than 3 days	ERAS (n=53)	SC (n=53)	P value
Hospital stays if more than 3 days	0	6	0.027†

† Fisher Exact test

Out of 53 patients in each group, no patients in ERAS group had hospital stay for more than 3 days whereas 6 patients in SC group had hospital stay for more than 3 days, the difference being statistically significant, p = 0.027.

Table 6: Cause of hospital stay if more than 3 days

Causes	ERAS (n=53)	SC (n-53)	P value
Baby in NICU	0	4	0.118†
Baby under IVA	0	0	-
PPH	0	0	-
Wound infection	0	0	-
Urinary Retention	0	0	-
Need of iv medication	0	0	-
Others	0	2	0.495†

† Fisher Exact test

No cases in ERAS group had hospital stay for more than 3 days, whereas 6 patients in SC group had hospital stay for more than 3 days with statistically significant difference p > 0.001. Among them 4 patients had prolonged stay as their baby were admitted in NICU, whereas 1 patient had developed abdominal distension post operatively and had prolonged hospital stay due to the same and another patient had prolonged stay for management of Gestational Hypertension.

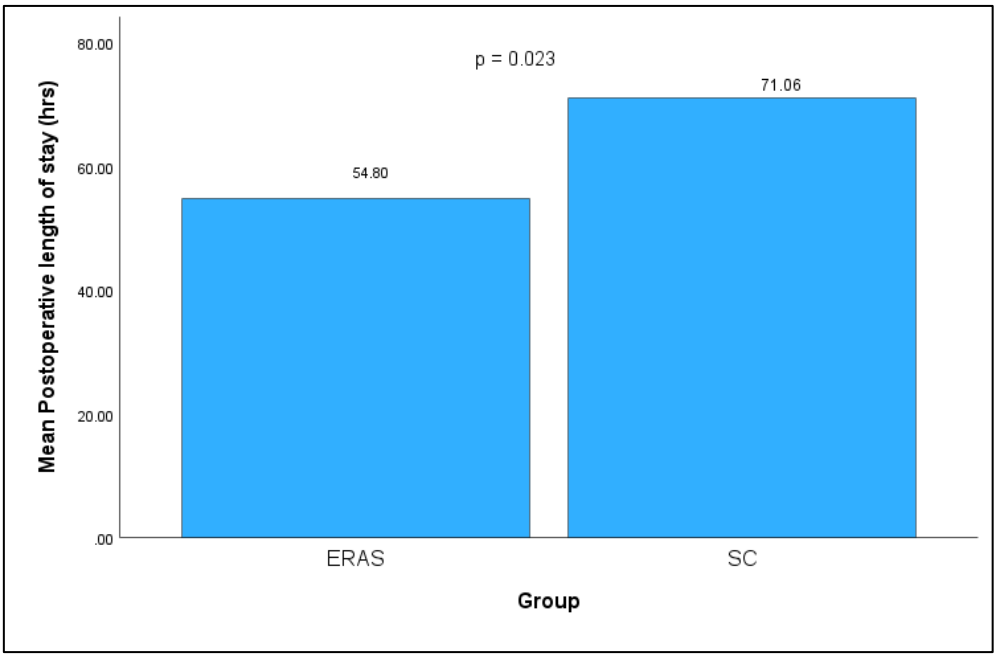

Figure 1: Post-operative Length of hospital stay

Figure 1: Bar chart showing post-operative length of stay

The mean post-operative length of stay between ERAS and SC has been shown in the above bar diagram. The mean length of stay in ERAS group is 54.80 ± SD 12 hrs and in SC group is 71.60± SD 49 hrs with significant difference, p = 0.023.

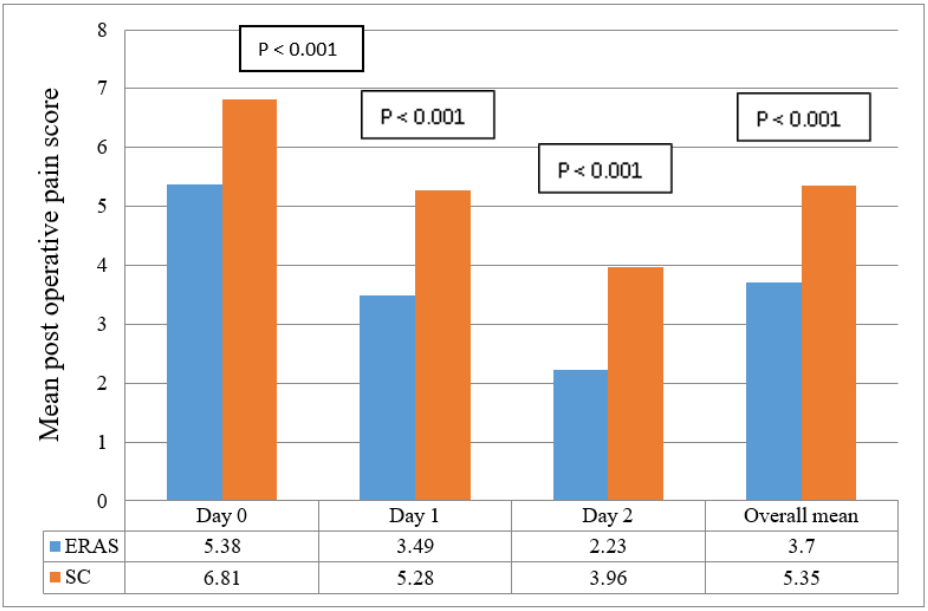

Figure 2: Post-operative pain score

Figure 3: Mean post-operative pain score between two groups

Mean post-operative pain score on Day 0 in ERAS was 5.38 vs. 6.81 in SC, on Day 1 was 3.49 in ERAS vs. 5.28 in SC, on Day 3 was 2.23 in ERAS vs 3.96 in SC, overall pain score of 3.7 in ERAS vs. 5.35 in SC, with difference on pain scores on each day and overall pain score being statistically significant, p < .001.

DISSCUSION

Caesarean Section (CS) is the most common surgery in obstetric practice. In today's context CS rate accounts for more than 1 in 5 (21%) of all live birth and WHO has projected that by 2030, nearly a third (29%) of all live birth will take place by CS [10]. This increasing rate of caesarean section has created pressure in maternity service world-wide. As most of the CS patients are young and healthy, they have potential for rapid recovery and their early discharge can be prompted by implementation of ERAS protocol. Though developed in 1990s, there has been slower embracing of ERAS in caesarean delivery. Implementation of ERAS protocol has shown higher maternal satisfaction, early recovery and early discharge and in a developing country like ours its application can reduce burden over health facility and also ensures better maternal and neonatal outcome.

Patient demographic and clinical characteristics

In this study there was no statistically significant difference between ages and Body mass Index between ERAS and Standard Care(SC) group. Therefore, it can be said that the sample population between ERAS and SC group was comparable with each other in respect to age and BMI. The sample population in this study was similar to the sample population in studies by Tamang *et al.*, [3], MacGregor *et al.*, [11], Grasch *et al.*, [12], Mullman *et al.*, [13], Teigen *et al.*, [14], Baluku *et al.*, [9], Fay *et al.*, [15] and Wrench *et al.*, [16]. However, in the study by Pineyro *et al.*, [17], there was statistically significant difference between two groups in respect to age with older women in ERAS group which can be attributed to more elderly women considered for elective CS and also larger sample population in the study.

In regard to co-morbid conditions, 77.4% in ERAS and 79.4% in SC group had no co-morbid conditions with 5.7% patients in each group having each of DM and HTN. The findings were similar to study by Shinnick *et al.*, [18] in which Hypertension was present in 4.9 % of and DM in 5.7% of the ERAS group. However, this was in contrast to study by Fay *et al.*, [15] with increased number of patients with co-morbid conditions particularly Hypertension and Diabetes Mellitus which can be attributed to higher number of study population in the study.

Pregnancy Characteristics

On analyzing the data, there was no significant difference between parity, duration of gestation and indication for caesarean section in between two groups. The study group were comparable in terms of pregnancy characteristics as well. 66% of CS in ERAS and 67.9% in SC group were done for prior 1 CS. This was similar to study by Grasch *et al.*, [12], Tamang *et al.*, [3] and Fay *et al.*, [15].

However, in the study by Baluku *et al.*, [9] the common indication for caesarean section in both groups was cephalopelvic disproportion contributing to 29.1 % and 21.5% of CS followed by prior > 2 CS.

Surgical Characteristics

The mean duration of surgery in the study was 43.67 minutes in ERAS group and 47.54 minutes in SC group with no statistically significant difference, p =

0.08. In the similar study done by Gupta *et al.,* [19], the mean duration of surgery in ERAS group was 31.35 minutes and 31.50 minutes in traditional group with p = 0.07. Hence the duration of surgery in the studies were similar. However, this finding in the study is in contrast to study by Ubom *et al.,* [20] which showed a significant difference in operative time in pre-ERAS and post ERAS implementation group with p < 0.001 which can be attributed to larger study population in the study, total of 4903, with increased intra operative complications prolonging the duration of surgery.

There was a significant difference in intra operative fluid requirement in the study with mean volume of 1350 ml in ERAS group and 1650 ml in SC group with p < 0.001. The decreased fluid requirement in ERAS group can be attributed to shorter NPO status prior to surgery and early NPO break after surgery.

Estimated blood loss in two groups was not statistically significant p = 0.52. This was comparable to the study by Wrench *et al.,* [16] and Shinnick *et al.,* [18]. Study by Teigen *et al.,* [14] showed an estimated blood loss in an average of 800 ml in both groups with p = 0.79

There was no need of blood transfusion in either group. This is comparable to study by Tamang *et al.,* [3], Teigen *et al.,* [14], Ubom *et al.,* [20], and Kleimann *et al.,* [21].

Length of hospital stay

The difference in mean length of stay between two groups was 16 hours with average length of stay in ERAS group being 54.80 hours and SC group being 71.00 which was statistically significant with p = 0.023. This is comparable to study by Tamang *et al.,* [3] and Baluku *et al.,* [9] which showed a difference of 21 hours and 18 hours respectively in two groups. Study by Fay *et al.,* [15], Shinnick *et al.,* [18], Teigen *et al.,* [14] showed a difference of 7.8 hours, 7.9 hours and 2 hours respectively which were statistically different but the difference was smaller than this study.

Study by Pineyro *et al.,* [17] also had a significant difference of 6 hours between two groups with p < 0.001.

With an average length of stay in ERAS group being 54.80 hours, the patients in ERAS group were discharged in post-operative day 2 which is comparable to study by Mullman *et al.,* [13] which showed a reduction from 3.2 to 2.7 days in post ERAS group and by Kleimann *et al.,* [21] in which there was reduction from 2.9 to 2.5 days with p < .0.001 in both studies and similar finding in Teigen *et al.,* [22].

Similar findings were reported in study by Ubom *et al.,* [20], Gupta *et al.,* [19] and Mac Gregor *et al.,* [11] with discharge of patients on 2-3 days, 2.85 days and 2.37 days respectively in ERAS group in contrary to discharge on 3-4 days, 5.25 days and 4.62 days respectively in control group.

The significant difference in the studies in European countries can also be attributed to the fact stated by NICE guidelines which states that women who do not have complications after Caesarean section can be discharged 24 hours post operatively with follow up at home.

Similar study by Jakhetiya *et al.,* [23] showed a difference of 36.6 hours between two groups which may be attributed to the existing hospital policy of discharge on day 5.

However, this is in contrast to study by Comb's *et al.,* [24], Birchall *et al.,* [25], Lester *et al.,* [26] which showed no significant difference in length of stay between two groups.

Post-operative opioid use

Multimodal analgesia was used in ERAS group with Injectable Acetaminophen and injectable NSAIDs. Opioid analgesia was used in combination with NSAIDs in SC group This is comparable to study by Mac Gregor *et al.,* [11] which showed no opioid use post ERAS implementation. Also study by Grasch *et al.,* [12] showed opioid free recovery in 29% patients in ERAS group.

Multiple studies have showed reduction in opioid use post ERAS implementation. However, amount of opioid use was not analyzed in this study so; the results of this study couldn't be interpreted in terms of amount of opioid use as compared to other studies.

Post-operative pain scores

In the study mean pain score in two groups on Day 0 was 5.38 vs. 6.81, on Day 1 was 3.49 vs. 5.28 and Day 2 was 2.23 vs. 3.96 with p < 0.001. These findings are comparable to study by Ruymann *et al.,* [27],Ubom *et al.,* [20] (2.9 vs 3.4) and Mac Gregor *et al.,* [11] (4.67 vs 5.28).Study by Xue *et al.,* [28] also showed a significant difference in VAS score between two groups at each point of time. Overall pain score in ERAS group was 3.7 and in SC group was 5.25 group.

Study by Kleimann *et al.,* [21] showed a significant difference in VAS score in two groups 7 (5-9) in ERAS group and 8 (7-9) in control group. However, the average pain score was higher as compared to this study.

The lower pain score in ERAS group can be attributed to use of multimodal analgesia round the clock during post-operative period throughout hospital stay which is in contrast to use of opioid analgesia for breakthrough pain in SC group.

Contrary to the findings of the study, study by Lester *et al.*, [26], Grasch *et al.*, [12] and Shinnick *et al.*, [18] showed no significant difference in pain score between two groups.

Post-operative complications

Post-operative complications were evaluated in terms of post-operative nausea, vomiting, spinal headache, Urinary tract infections, fever, PPH and hospital readmission. Only 1 patient in each of ERAS and SC group had post-operative nausea and vomiting. Only 2 patients in each of ERAS and SC group had PPH which was not significant statistically.

These findings are comparable to study by Tamang *et al.*, [3], Kleimann *et al.*, [21], Pineyro *et al.*, [17] and Grasch *et al.*, [12] as all these studies showed no significant differences in post-operative complications between two groups. However, the fact that has to be considered in the study is that the sample population was lower because of which the findings cannot be generalized.

Lester *et al.*, and HERMES study by Uyaniklar *et al.*, [29] also showed no significant difference in incidence of post-operative complications between two groups.

In contrast to this study, the study by Baluku *et al.*, [9] showed significant difference in post-surgery headache in two groups, $p < 0.001$ despite the sample population being comparable.

Prolonged hospital stay

No patients in ERAS had hospital stay > 3 days whereas 6 patients in SC group had prolonged hospital stay with statistically significant difference $p < 0.001$. Among 6 patients, 4 patients had prolonged stay as their baby were admitted in NICU, 2 cases for NNJ, 1 for RDS and 1 for early onset neonatal sepsis, 1 patient developed abdominal distension post operatively and 1 patient had persistently high blood pressure post operatively. The patient developing abdominal distension was NPO for 18 hours prior to surgery as her surgery was pushed back due to emergency cases highlighting the increasing incidence of Caesarean section rate. This is comparable to study by Ubom *et al.*, [20] and Fay *et al.*, [15]. However, whether allocation in groups can be attributed to the prolonged hospital stay couldn't be concluded.

LIMITATIONS

This is a single center study which only included 106 patients with 53 in each group. Other outcomes of ERAS that could have been further evaluated from this study are amount of opioid analgesia in both group, patient satisfaction scores and exclusive breast feeding. Only elective cases were included in the study so the benefits of implementing ERAS in emergency cases or its feasibility in emergency cases couldn't be analyzed. For generalization of the findings, the study needs to be conducted in a larger sample population. Cost effectiveness of ERAS couldn't be analyzed as Paropakar Maternity and Women's Hospital is a tertiary level hospital where maternal and neonatal service is free of cost under Safe Motherhood Program of Nepal Government.

CONCLUSIONS

In the existing controversies regarding NPO status prior to surgery, initiating of early feeding, time for ambulation, time for Foley catheter removal and use of opioid based analgesia, this study has shown that implementation of ERAS protocol is associated with decrease in intra operative fluid requirement, decrease in post-operative length of hospital stay and is associated with significant difference in post-operative pain with use of multi modal analgesia. These findings suggest that ERAS can be implemented in Caesarean delivery for addressing the issues of prolonged immobilization, delayed discharge, increased bed occupancy and many more issues associated with it promoting early discharge and overall recovery process of the patient.

RECOMMENDATION

Paropakar Maternity and Women's Hospital is a tertiary-level hospital where the Caesarean Section rate is 30-35% per day. This high rate has led to increased bed occupancy and a growing number of patients awaiting admission. The application of multiple components of Enhanced Recovery after Surgery (ERAS) has shown significant benefits, including a reduction in intraoperative fluid volume, postoperative length of stay, and postoperative pain scores, promoting early discharge.

Allowing clear liquids up to two hours before surgery and breaking nil per oral (NPO) status early reduces the need for intravenous fluids. Early removal of the Foley catheter encourages early ambulation. Nonsteroidal anti-inflammatory drugs (NSAIDs) can be used instead of opioid analgesia, reducing postoperative pain scores. Implementing multiple ERAS components as a bundle results in the greatest patient benefit.

Given these advantages, incorporating the ERAS protocol into perioperative care for patients would be highly beneficial.

APPENDICES

Caesarean Section:

Caesarean Section is defined as an operative procedure whereby the fetuses after 28th week of gestation are delivered through an incision on the abdominal and uterine walls.

ERAS:

Enhanced recovery after surgery (ERAS) protocols are multimodal peri-operative care pathways designed to achieve early recovery after surgical

procedures by maintaining preoperative organ function and reducing the profound stress response following surgery

Day of surgery: *1st 24 hrs; 1st POD: 24-48 Hrs; 2nd POD: 48-72 Hrs*

Fever: *Fever is defined as skin temperature (axillary) > 99ºF*

Post-partum hemorrhage:

It is defined as any amount of blood loss in to birth canal after the delivery of baby which affects the hemodynamic stability of patient manifested by decrease in blood pressure, tachycardia or symptoms of syncope.

Length of stay: *Time from completion of surgery to the time of discharge*

Puerperal Sepsis:

Puerperal sepsis is defined as infection of the genital tract occurring at any time between the rupture of membranes or labour and the 42nd day postpartum in which two or more of the following are present:

- Pelvic pain
- Fever i.e. oral temperature 101.3º F or higher on any occasion
- Abnormal vaginal discharge, abnormal smell/foul odour or discharge
- Delay in the rate of reduction of size of the uterus.

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