Original Article

Evaluating The Effects of Enhanced Recovery After Surgery (ERAS) Protocol on Maternal Outcomes Following Caesarean Delivery

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ABSTRACT

Background: Enhanced recovery after surgery (ERAS) is a protocolised approach to perioperative care, aiming to enhance maternal recovery following surgery. It is accompanied by an improvement in maternal and neonatal outcomes, comprising diminished length of hospital stay (LOS), opioid need, postoperative pain (POP) scores, adverse events, higher maternal satisfaction, and enhanced breastfeeding (BF) success.

Aim: To evaluate the effectiveness of ERAS on maternal outcome after cesarean delivery (CD) in Mansura university hospital.

Methods: This was a clinical randomized controlled trial (RCT) conducted on a total of 100 pregnant ladies, divided into two equal groups: group A enrolled 50 patients treated with the ERAS protocol (study group), and group B enrolled 50 patients who were not treated with the ERAS protocol (control group). The outcomes included post-operative hospital length of stay, postsurgical adverse events such as postoperative nausea and vomiting (PONV), fever, hospital readmission, breastfeeding at discharge, and maternal satisfaction.

Results: Marked increase in ambulation time and LOS were recorded in group B compared to group A. Complications (nausea and vomiting) were markedly decreased in ERAS group compared to the control group. Pain score was markedly increased in the control group compared to intervention one. ERAS group was accompanied by significant increases in maternal satisfaction and maternal satisfaction compared to the control group. Breast feeding on discharge was more frequent among intervention than control group with significant difference between them.

Conclusion: The study found that the ERAS was able to significantly decrease postoperative pain (POP) and shortened LOS, without increasing the negative impact on the surgical outcome. As a result, strategies implementing the ERAS in CS seem to be efficient and safe.

Key Words: Caesarean delivery, ERAS, length of stay.

Received: 28 September 2024, **Accepted:** 12 December 2024

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ISSN: 2090-7265, 2025, Vol. 15

INTRODUCTION

Caesarean section (CS) is a frequent surgery conducted all over the world. Novel global data recommend that about one out of five females give birth by CS[1,2]. With regard to the United Kingdom, the majority of cases are still in hospital for 48 hours or more after CS, while in Australia the mean LOS following CD (without complication) is four days[3].

With the major number of CS being conducted, there are several possible advantages arising from diminished LOS, increasing maternal satisfaction, and a possible reduction in hospital charges[4,5]. According to such advantages and the increasing requirement on maternity services, there has been an increasing need for the implementation of ERAS in terms of CS[6,7]. On the other hand, in contrast to the remaining studied disciplines, ERAS in the context of the obstetric population includes a cohort of cases being young, healthy, interested and are returning home with a baby. As a result, the main focus is maternal and neonatal safety together with maternal satisfaction[4]. Since then, several enhanced recovery programs (ERPs) have been emerged to standardise perioperative care, limit postsurgical organ dysfunction, and expedite recovery to basal functional condition and health following surgery[8].

ERAS is a process management tool that facilitates the development of a targeted care procedure. The application of audit and feedback, in which medical professionals receive comparative data to inform, modify, and lessen the "harmful" variances recognized in specialized high-volume clinical care processes and methods that have the likelihood to enhance patient safety, care quality, and health outcomes[9]. As a result, we aimed to evaluate ERAS efficacy on maternal outcome after cesarean delivery in Mansura university hospital.

DOI:10.21608/EBWHJ.2024.324398.1362

PATIENTS AND METHODS

This was a clinical RCT conducted on one hundred pregnant ladies at Obstetrics & Gynecology department at Mansoura University Hospital with a period of one year start from January 2023. All cases included in the study were informed about the aims, and the steps of the procedure. An informed consent was taken from each participant. This study included pregnant ladies between 18-40 years old with full term healthy singleton pregnant. They were prepared for elective CD (ECD) by spinal anesthesia but excluded females with medical disorders with pregnancy, with placenta previa, with surgical complications as bladder or intestinal injury during delivery, and with fetal congenital anomalies.

Methods

After acceptance of the IRB of Mansoura Faculty of Medicine, the patients were randomly divided into two groups, group A enrolled 50 patients treated with ERAS protocol (Study group) and group B enrolled 50 patients who were not treated with ERAS protocol (control group). Every female was subjected to complete history taking, complete general examination, obstetric examination, routine antepartum laboratory investigations (CBC, PT, APTT, Cr, SGOT, SGPT) and transabdominal obstetric ultrasound to assess gestational age and exclude multiple pregnancy and fetal congenital anomalies. Regarding pain score, all patients were trained how to express their pain on an eleven point scale (VAS), from zero to ten, with zero for no pain, and ten for the maximum pain ever felt[10].

Procedures

Patients who were treated with ERAS protocol (study group), preoperative preparation included minimization of fluid fasting time and permitting clear fluids up to 120 minutes following the surgery and reducing fasting times for food) 8 h for solids). Intraoperative included prophylactic antiemetics, delayed cord clamping at least 30 – 60 second after birth, and Oxytocin 30 international unit in 500 ml normal saline (NaCl 0.9%) were used. While postoperative included prevention of nausea and vomiting by using ≥2 agents as four mg ondansetron, 10 mg metoclopramide, and four mg dexamethasone, early removal of urinary catheter after 2 h and pain management included, in day 1, acetaminophen 1gm /6h and ketorolac iv (30mg first dose ,then 15 mg thereafter)/8h, and, in day 2, acetaminophen 1gm /8h, diclofenac sodium 25-50 mg IM for breakthrough pain, early mobilization once block worn off (within six hours), resuming full diet in postpartum unit and removal of IV access 24h postoperative.

Patients who were not treated with ERAS protocol (control group), preoperative preparation included NPO 8 hours before surgical time for solids and fluid, intraoperative included oxytocin 40 IU in one liter of normal saline with immediate cord clamping, postoperative included pain management which included acetaminophen 1gm /12h, IV nalbuphine (for breakthrough pain), urinary catheter removal after 12 h, ambulation next day and IV access maintained for the LOS.

Outcomes

The primary outcomes included post-operative LOS, and the effect on maternal opioid consumption. The secondary outcomes included postsurgical adverse events which include PONV, postsurgical fever, requirement for re-operation, incidence of postsurgical venous thromboembolism (VTE), hospital readmission, Breastfeeding at discharge, Maternal satisfaction of early discharge with newborn, pain control according to visual analogue scale and if the patient satisfied sufficient to recommend it to a friend as regard information and involvement in decision making, postpartum care, pain control and meeting expectation.

Ethical Considerations

Informed verbal consent was taken from all the studied subjects. Privacy was respected. The results were used for scientific purposes only. Acceptance of the IRB of Mansoura Faculty of Medicine was obtained before starting the research.

Statistical Analysis

Data were analyzed using SPSS version 28. Qualitative data were presented as number and percent, Quantitative data were evaluated for normality by Shapiro-Wilk test then described as mean and SD for normally distributed data and median and range for non-normally distributed. Chi-Square for categorical variable, Student t test, Mann Whitney and Spearman or Pearson correlation were used to correlate continuous variables.

RESULTS

The present study was randomized clinical trial (RCT) that is conducted to evaluate effectiveness of ERAS on maternal outcome after CD in Mansura university hospital. Assessment of cases eligible for the study was done on 110 cases; 10 were excluded as they not met inclusion criteria set for the present study than 100 cases were classified into two groups; one treated with ERAS protocol and the other is control group (50 in each group) (Figure 1, Table 1) demonstrates that there is no significant difference between studied groups concerning age, obstetric history and body mass index which mean that they are matched groups. (Table 2) illustrates statistically significant longer ambulation time in group B than group A (7.44±0.84 versus 4.74±0.89 hours, respectively). A significant higher LOS

was recorded in group B compared to group A (3.62±0.69 and 2.24±0.47 days, respectively). (Table 3) demonstrates that higher incidence of nausea and vomiting was detected among control than intervention group (48% nausea and 4% vomiting among control arm versus 12% nausea with no vomiting among intervention arm). Median Pain score was higher among control than intervention arm (6 ranging from 4 to 9 versus 5 ranging from 4 to 7). Breast feeding on discharge was more frequent among intervention than control group (94% & 76%, respectively) with a significant difference between them. Maternal satisfaction was significantly higher among group A than group B (98% & 26%, respectively). Post-operative headache illustrates no significant difference between studied groups. (Table 4) shows that in group A, there was no significant relationship between body mass index and ambulation time (r=0.022, p=0.879), and LOS (r=-0.104 , p=0.472).

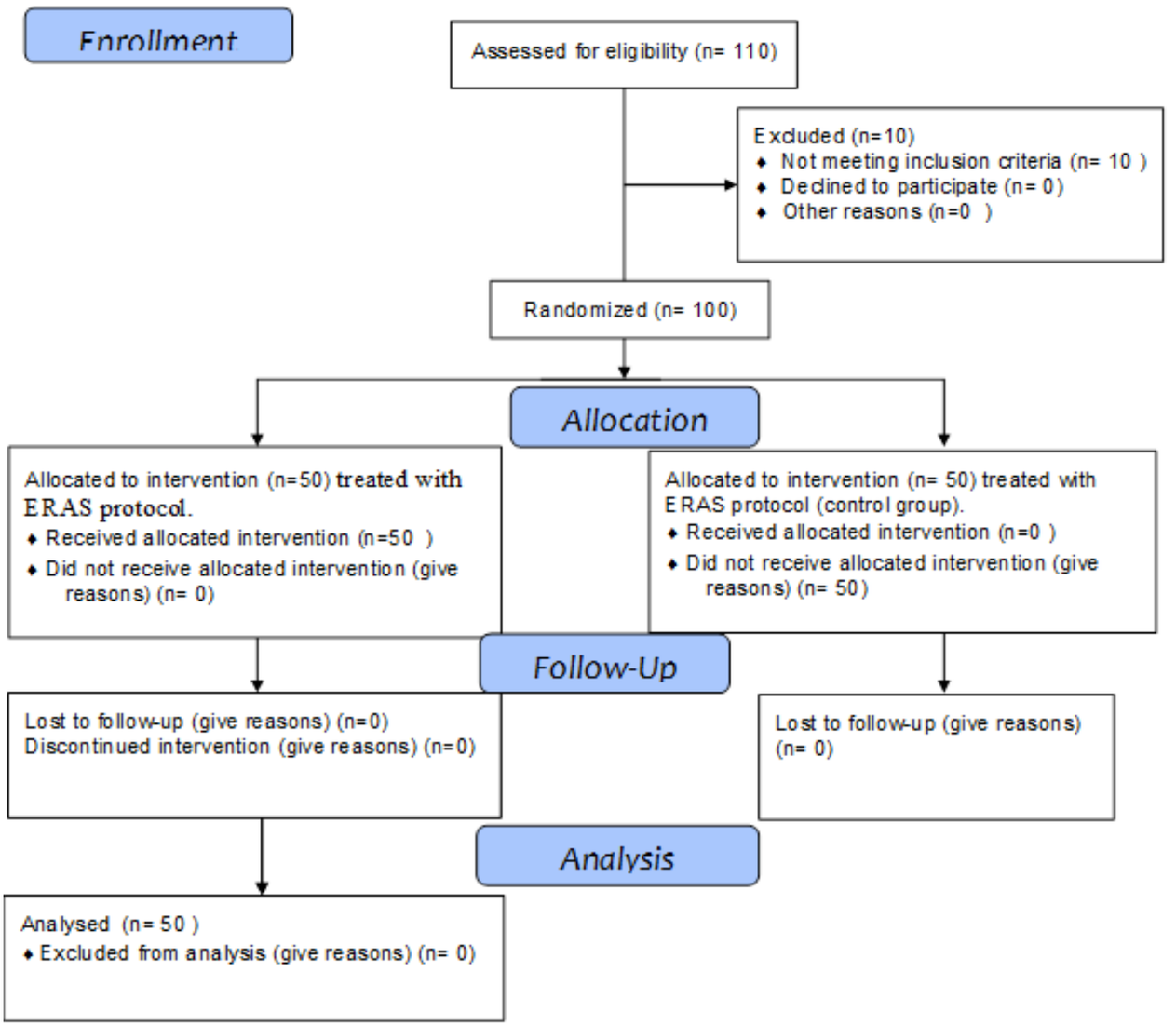

Fig. 1: Consort flow chart

Table 1: Demographic, obstetric history and body mass index of the studied groups

	Group A n=50	Group B n=50	test of significance
Age/years			t=0.535
Mean±SD	28.36±6.43	29.04±6.28	p=0.495
Gravidity			z=0.039
Median (min-max)	3(1-10)	3(1-10)	p=0.969
Primi gravida	3(6%)	6(12%)	$\chi2$=1.17
2-3	28(56%)	25(50%)	p=0.557
>3	19(38%)	19(38%)	
Parity			z=0.075
Median (min-max)	2(0-5)	2(0-5)	p=0.940
Nulli para	3(6%)	6(12%)	$\chi2$=2.44
1-3	44(88%)	38(76%)	p=0.295
>3	3(6%)	6(12%)	
Cesarean delivery			z=0.282
Median (min-max)	2(0-5%)	2(0-5%)	p=0.778
0	5(10%)	9(18%)	$\chi2$=1.33
1-3	44(88%)	40(80%)	p=0.513
>3	1(2%)	1(2%)	
Vaginal delivery			z=0.096
Median (min-max)	0(0-3)	0(0-5)	p=0.924
0	40(80.0)	41(82.0)	$\chi2$=2.54
1-3	10(20.0)	7(14)	p=0.281
>3	0	2(4)	
Gestational age (weeks)			t=0.569
Mean±SD	38.26±0.88	38.38±1.07	p=0.571
BMI (Kg/m^2)			t=1.82
Mean±SD	29.29±2.95	30.53±2.73	p=0.072

t: Student t test, Z: Mann Whitney U test, $\chi2$: Chi-Square test

Table 2: Comparison of ambulation time and length of stay among studied groups

	Group A n=50	Group B n=50	test of significance
Ambulation time (hours)			t=15.54
Mean±SD	4.74±0.89	7.44±0.84	$p<0.001^*$
length of stay(days)			t=11.56
Mean±SD	2.24±0.47	3.62±0.69	$p<0.001^*$

t: Student t test, *statistically significant

Table 4: Comparison regarding fever, DVT, Re-admission, Re-operation, nausea & vomiting, maternal satisfaction, pain score, breast feeding on discharge, and post operative headache among studied groups

	Group A n=50	Group B n=50	test of significance
Fever	6(12.0)	7(14.0)	$\chi2$=0.088 p=0.766
DVT	0	0	P=1.0
Re-admission	0	1(2.0)	FET=1.01 P=1.0
Re-operation	0	0	p=1.0
No **Nausea** **Vomiting**	44(88%) 6(12%) 0	24(48%) 24(48%) 2(4. %)	$\chi2$=18.68 p=0.001*
Maternal Satisfaction	49(98%)	13(26%)	$\chi2$=55.01 p=0.001*
Pain score Median (min-max)	5(4-7)	6(4-9)	z=2.51 p=0.012*
Breast feeding on discharge	47(94%)	38(76%)	$\chi2$=6.35 p=0.012*
Post operative headache No Yes	44(88%) 6(12%)	45(90%) 5(10%)	$\chi2$=0.102 p=1.0

$\chi2$=Chi-Square test, Z:Mann Whitney U test , *statistically significant

Table 4: Correlation between body mass index and ambulation time, length of stay among group A

	BMI (kg/m^2)	
Group A (n=50)	r	*p value*
Ambulation time (hours)	0.022	0.879
length of stay (days)	-0.104	.472

r: Spearman correlation coefficient

DISCUSSION

Enhanced recovery after cesarean delivery (ERAC) is a protocolised procedure to perioperative care, aiming to enhance postoperative maternal recovery. It is accompanied by an improvement of maternal and neonatal outcomes, such as diminished LOS, opioid need, pain scores, adverse events, increased satisfaction, and increased BF success. On the other hand, the current research provides low-quality evidence in favor of ERAC, and the speed of its acceptance globally hasn't yet been matched by high-quality proof displaying its benefits[11]. The current study aimed to assess the ERAS efficacy on maternal outcome following CD in Mansura university hospital.

This was a RCT conducted in the obstetrics & Gynecology department at Mansoura University Hospital within a period of over one year start from January 2023. Our study displayed that there were no significant differences between both groups concerning demographic and obstetric history as well as regarding all anthropometric measures.

Concerning ambulation time and LOS, out study displayed that there was a statistically significant longer ambulation time between group B than group A (7.44±0.84 versus 4.74±0.89 hours, respectively). Also, there was a statistically significant higher LOS between group B than group A (3.62±0.69 and 2.24±0.47 days, respectively). In agreement, Meng and his colleagues conducted their research on six studies with proper data recorded the LOS. They displayed that the ERAS protocol was linked to diminished LOS in comparison with the conventional group (P>0.05)[12]. Also, Kleiman and his colleagues conducted their study on a total of 357 women undergoing ECD. They have demonstrated that; a significant reduction in LOS (P <0.05) were displayed after the implementation of the ERAS protocol[13].

Notably, LOS is an essential tool in evaluating the advantages of surgical evidence that has recorded that early discharge following CS could enhance maternal satisfaction with minimal costs[15]. In addition, evidence has shown that, in low-risk subjects receiving CD, even day one or day two discharge seems to be safe and sufficient[14]. Clinically, re-admission rate is another issue, as greater frequency of readmission is a possible barrier for the ERAS implementation and adversely interferes with the patient's satisfaction[16].

Regarding complications, our study displayed that; there were significant reductions in complications in ERAS compared to the control group. There was a higher incidence of PONV between control than intervention group (48% nausea and 4% vomiting among control arm versus 12% nausea with no vomiting among intervention arm).

This came in the same line with Meng and his colleagues who have demonstrated that the available evidence recommended that the implementation of ERAS to CS significantly diminished postsurgical adverse events[12]. In accordance, Sultan and his colleagues have demonstrated that ERAC might participate significantly in improving patient experience without affection of complication rates[14].

Concerning pain score, the present study demonstrated that; the median pain score was higher among control than intervention arm (6 ranging from 4 to 9 versus 5 ranging from 4 to 7). This came in the same line with Meng and his colleagues who have demonstrated that; ERAS applying to CS significantly diminished the POP score and opioid need[12]. In accordance, Kleiman and his colleagues demonstrated that there was a significant difference in opioid need and in per-day postsurgical opioid consumption (P <0.05) and lower POP scores were demonstrated following the implementation of the ERAS protocol[13].

It has been speculated that advantageous effects to POP management and opioid need result from ERAS could be due to several causes. An essential issue of ERAS is the multimodal analgesia plan, demonstrated to reduce worries concerning opioid need, decrease POP, and improve patient satisfaction[17]. Particularly, the multimodal approach to opioid-sparing POP management implemented in ERAS brought additional advantages, which include earlier recovery of gut functions, reduction of LOS, foetal protection, and reduction in the risk of drug abuse[18,19]. Essentially, the reduction in POP score doesn't come at the price of elevated opioid need. As a result, it may be concluded that POP relief mostly benefited from the effects of ERAS implementation instead of extensive usage of opioid agents[12].

Regarding maternal satisfaction, our study recorded that; there was a significant increase in maternal satisfaction among ERAS group compared with the controls. In agreement, one study conducted on early discharge after CD (without complications) that pre-dates the concept of ERAS recorded greater maternal satisfaction in the early discharge group compared with females in a traditional care group[20]. In the same line, Meng and his colleagues have demonstrated that the charge of hospital admission was significantly reduced in the ERAS group compared to the controls, recommending that ERAS implementation in CS is cost-effective. On the other hand, due to the fewer number of studies evaluating data in hospital costs, additional high-quality studies are required to detect the actual cost-effectiveness of ERAS[12].

In terms of Breast-feeding readmission, the current study demonstrated that; breast feeding on discharge is more frequent among intervention than control group (94% & 76%, respectively) with a significant difference between them. Maternal satisfaction was significantly greater among group A than group B (98% & 26%, respectively). Sultan and his colleagues have demonstrated that; there was no significant difference in maternal readmission frequency between both groups (p>0.05)[14]. Also, Meng and his colleagues have displayed that; insignificant difference was noticed concerning to readmission frequency (^{p}>0.05)[12].

There are multiple causes addressing ERAS implementation with such remarkable outcomes. Comprehensive presurgical education and psychiatric counselling from ERAS protocols could be useful in alleviating the psychiatric pressure and enhancing patient satisfaction to ERAS protocol[21]. ERAS protocols decrease fasting time and increase carbohydrate consumption to alleviate the hunger stress and anxiety prior to CS, reducing the insulin resistance and the nutritional deficits in the postosurgical period[22]. ERAS protocol encourages rapid withdrawal of urinary catheter and mobilization, as a result reducing the possibility of infections and postsurgical VTE[23]. Standardised care practices, standardization of the usage of antibiotics (as a prophylaxis), and early mobilization in ERAS have reinforced significant drops in postsurgical infections[24]. Optimum analgesia, operative warming, and early postsurgical oral feeding are important to accelerate the recovery via keeping body homeostasis, encouraging early discharge, and decreasing postsurgical adverse events[25]. More essentially, the majority of the perioperative process is improved by ERAS and accomplishes additive advantages beyond the individual modifications[26].

CONCLUSION

The study found that the ERAS was able to significantly reduce postoperative pain and shortened the hospital stay, without increasing the negative impact on the surgical outcome. As a result, the implementation of the ERAS in CS appears to be efficient and safe. On the other hand, the findings have to be properly assessed with caution due to the restricted number and methodological quality of comprised researches.

RECOMMENDATIONS

According to the findings of the present study, future major, well-planned, and better methodological quality researches are required to prove or disprove the current results.

CONFLICT OF INTERESTS

There are no conflicts of interest.

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