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A comparison of maternal outcomes in complicated vaginal and cesarean deliveries

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Summary

Objective: The purpose of this study was to compare general characteristics, laboratory data, and maternal outcomes of patients who experienced complications in the first 24 hours after a normal vaginal delivery or cesarean section (C-section). This way, the authors intended to determine the results of complications in these patients. *Materials and Methods:* Data of patients referred from the peripheral care centers to the present tertiary care center in the first 24 hours after a vaginal delivery or C-section due to the presence of various complications were screened retrospectively from 2009 to 2013. Clinical and demographic characteristics, laboratory parameters, indications for C-section, mortality rates, maternal morbidities, surgical and medical treatments administered in the clinic, as well as operations performed in other care centers were noted. *Results:* A total of 330 patients were included in this study. Of these patients, 285 constituted the postoperative group (C-sections) whereas 45 constituted the postpartum (vaginal deliveries) group. There was no statistically significant difference between the two groups in demographic characteristics, results of laboratory parameters, maternal morbidity, and mortality rates. Requirement of hysterectomy and relaparotomy was significantly higher in the postoperative group. *Conclusions:* In the early follow-up, it was found that complicated C-sections and vaginal deliveries had similar results. However, it should also be mentioned that higher requirement of hysterectomy and relaparotomy emerged as an undesirable condition among the postoperative patients in this study. With this in mind, mode of delivery should be selected according to the overall health status of the patient and indications for C-section.

Key words: Cesarean sections; Vaginal deliveries; Complications.

Introduction

The reported rate of cesarean section (C-section) is 10-25%, with marked differences in some parts of the world [1]. Although minor and severe complications associated with the delivery were reported to be higher in C-sections compared to vaginal deliveries, the rate of C-section is increasing around the world [2- 4]. Improved safety in surgical and anesthetic skills and changing viewpoints of doctors and patients on C-section can be listed among the main reasons for such an increase [5]. In this respect, it is becoming increasingly important to know the exact risks and benefits of C-section.

In a recent study, C-section was not directly associated with poor maternal outcomes; however, this mode of delivery was reported to increase the possibility of undesirable neonatal outcomes [6]. In a French study, C-section was associated with an increased risk of postpartum maternal death [7]. With regards to complications and outcomes, it should be mentioned that some complicating conditions including history of previous C-section, fetal distress, abnormal forces of labor, abnormality in fetal heart rate or rhythm, malposition/malpresentation, umbilical cord complications, eclampsia, preeclampsia, anemia, problems of amniotic cavity, and advanced maternal age more frequently accompany C-sections compared to vaginal deliveries [8]. These conditions may play a role in the high complication rates reported in C-sections.

The purpose of this study was to compare general characteristics, laboratory data, and maternal outcomes of patients who experienced complications in the first 24 hours after a normal vaginal delivery or C-section. This way, the present authors intended to determine the results of complications in these patients. To the best of their knowledge, there is currently no study in the literature comparing the maternal outcomes of complicated cases in different modes of delivery.

Materials and Methods

This study was conducted in the Obstetrics and Gynecology Clinic of Dicle University and approved by the Local Ethics Committee of the university. In the study, data of patients referred from the peripheral care centers to the present tertiary care center in the first 24 hours after a vaginal or cesarean delivery due to the presence of complications were screened retrospectively from January 2009 to December 2013. In addition, clinical and demographic characteristics, results of physical examinations, laboratory parameters (complete blood count, liver and kidney function tests, electrolyte levels and coagulation parameters), indications for C-section, blood transfusion requirements, length of stay, and oper-

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Table 1. — *General characteristics and laboratory findings of the study participants.*

	Postoperative (n=285)	Postpartum (n=45)	*p*
Gravidity	4.5 ±3.1	5.0 ±3.4	0.19
Age (years)	32.3±7.5	33.9±8.5	0.38
Parity	3.5±2.9	3.9±2.9	0.13
Previous abortions	0.5±1.1	0.3±0.6	0.36
Live births	3.9±2.9	4.6±3.4	0.89
Systolic blood pressure (mm Hg)	124.7±28.5	126.4±32.0	0.71
Diastolic blood pressure (mm Hg)	78.5±17.5	78.0±19.7	0.88
Pulse rate (dk)	93.1±14.3	91.4±15.3	0.46
Body temperature (°C)	36.4±0.4	36.4±0.37	0.74
White blood cell count (K/uL)	16.4±14	19.8±24.0	0.15
Platelet count (K/uL)	185.3±124	182.8±94.0	0.89
ALT (U/L)	51.0±110	54.1±133.0	0.89
AST (U/L)	87.5±189	103.6±208.8	0.60
Urea (mg/dl)	23.4±14.8	22.2±12.7	0.71
Creatinine (mg/dl)	0.8±1.0	0.74±0.53	0.86
Aptt (sec)	33.4±17.9	32.0±17.8	0.62
D-Dimer (mg/L)	6.1±8.1	5.2±7.0	0.47
Total hospital length of stay (in days)	4.6±3.8	3.4±3.8	0.48
Length of stay in intensive care unit (in days)	0.2±0.8	0.1±0.5	0.57
FFP transfusion in this clinic (persons)	1.2±1.8	0.7±1.2	0.090
Fresh blood transfusion in this clinic (persons)	0.4±0.9	0.0±0.2	0.003
INR	1.1±0.37	1.8±2.8	0.074
LDH (U/L)	552.8±471.2	668.2±579.7	0.502
FFP transfusion in other hospitals (persons)	0.2±0.7	0.1±0.3	0.540
Previous C-sections	1.1±0.5	0	0.001
Hb (g/dl)	10.3±2.3	13.2±18.4	0.373

ALT: alanine amino transferase, AST: aspartate amino transferease, Aptt: activated partial thromboplastin time, INR: international normalized ratio, FFP: fresh frozen plasma, LDH: lactate dehydrogenase, Hb: hemoglobin.

ations performed in the present clinic, as well as other care centers were noted. As the purpose of this study was to compare the postoperative and postpartum groups, operations performed after a C-section were not regarded as relaparotomy. The relaparotomy group comprised of those C-section and vaginal delivery cases who underwent an urgent operation in other care centers and required a second operation in the present clinic. Maternal morbidities including acute renal failure, blood transfusion requirements and infections, and mortality rates occurring during the present clinical follow-up were also noted. Data were collected from the patients' records.

Statistical analysis

Statistical analyses were performed by SPSS 17.0 software and the data were expressed as mean ± standard deviation. Distribution of data was analyzed by Kolmogorov-Smirnov test. As to the comparison of variables, Student-*t* test was used for variables which demonstrated a normal distribution, and Mann-Whitney U test was used for those which did not demonstrate a normal distribution. Kruskal-Wallis and Chi- square tests were used for comparison of data between multiple groups. A *p* value smaller than 0.05 was considered statistically significant.

Table 2. — *Histories and outcomes of study participants.*

	Postoperative (n=285, %)	Postpartum (n=45, %)	*p*
Smoking	11 (3.9)	0	0.180
Presence of systemic diseases	20 (7.0)	3 (6.7)	0.932
History of surgery	149 (52.3)	1 (2.2)	0.001
Blood transfusion in the first 24 hours after delivery	67 (23.6)	2 (4.4)	0.103
Unconsciousness	18 (6.3)	3 (6.7)	0.929
Additional operations performed in this clinic	54 (18.9)	6 (13.3)	0.001
Referral to another hospital	20 (7.0)	5 (11.1)	0.330
Maternal morbidity	23 (8.1)	5 (11.1)	0.490
Maternal mortality	2 (0.7)	1 (2.2)	0.310

Results

A total of 330 patients were included in this study. Of these patients, 285 were in the postoperative group (C-sections) whereas 45 were in the postpartum group (vaginal deliveries). There was no statistically significant difference between the groups in gravidity, parity, age, vital signs, liver or kidney function tests, hemoglobin levels, white blood cell counts, length of stay, and live birth rates (Table 1). With regards to the maternal morbidity and mortality rates, no significant difference was found between the two groups (Table 2). The following were accepted as morbidity: acute renal failure, intracranial hemorrhage, requirement of ureteral ligation, unconsciousness, gluteus muscle atrophy, liver failure, surgical site infections, bladder injury, and intra-abdominal abscess (Figure 1). Although the two groups' hemoglobin and INR values were not significantly different from each other, fresh blood transfusion required in the present hospital was significantly higher in the postoperative group compared to the postpartum group ($p = 0.003$) (Table 1).

There was no significant difference between the two groups with respect to the presence of concomitant diseases during pregnancy. Indications for C-section in the postoperative group were as follows: preeclampsia, eclampsia, placental abruption, previous C-sections, antenatal bleeding, uncompleted delivery, and HELLP syndrome.

Two patients with persistent fever and poor overall heath status who were referred to the present hospital from another care center in the first 24 hours after C-section were followed, operated, and found to have intra-abdominal abscesses (Figure 1).

In the postoperative group, mortality was reported in two patients which was attributed to intra-abdominal hemorrhage and shock. In these patients, indications for C-section were

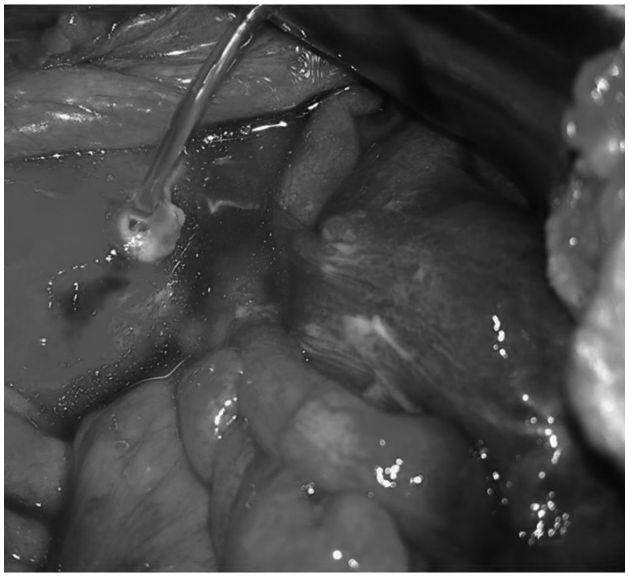

Figure 1. — A case of intra-abdominal abscess which is life-threatening in the postoperative period.

Table 3. — *Operations performed in this clinic.*

	Hysterectomy	Hypogastric artery ligation only	Hematoma drainage	Hysterectomy + hypogastric artery ligation	*p*
Postoperative	18 (6.3%)	16 (5.6%)	18 (6.3%)	2 (0.7%)	0.001
Postpartum	0	1 (2.2%)	1 (2.2%)	4 (8.8%)	

HELLP syndrome and placental abruption. In the postpartum group, on the other hand, mortality was reported in one patient which was attributed to intracranial hemorrhage (Figure 2). The groups' morbidity rates are demonstrated in Figure 2. Acute renal failure was the most frequent morbidity in both groups. It was found in 21.7% of the postoperative group and 40% of the postpartum group.

In the postoperative group, hysterectomy was performed in 18 patients and hypogastric artery ligation was performed in 16 patients. In the postpartum group, on the other hand, 'hysterectomy + hypogastric artery ligation was performed in four patients and 'hypogastric artery ligation

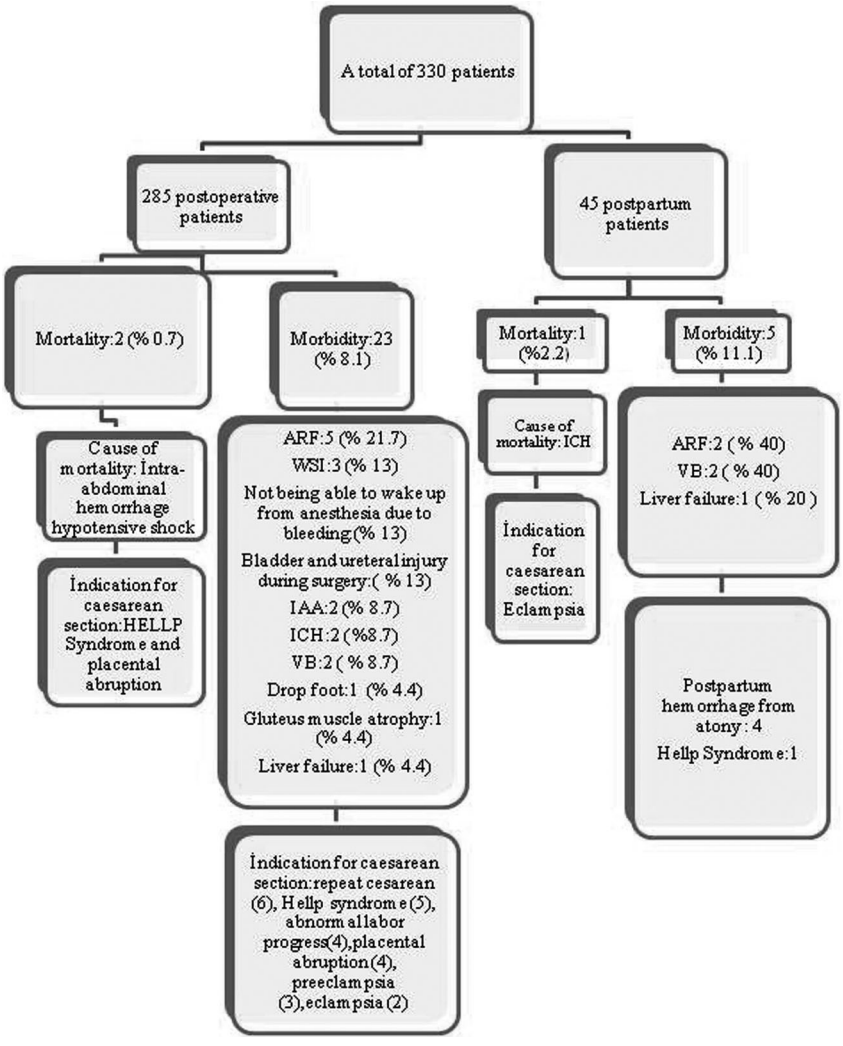

Figure 2. — Mortality and morbidity rates of the study participants (ARF: acute renal failure, IAA: intra-abdominal abscess, VB: vaginal bleeding, WSI: wound site infection, and ICH: intracranial hemorrhage).

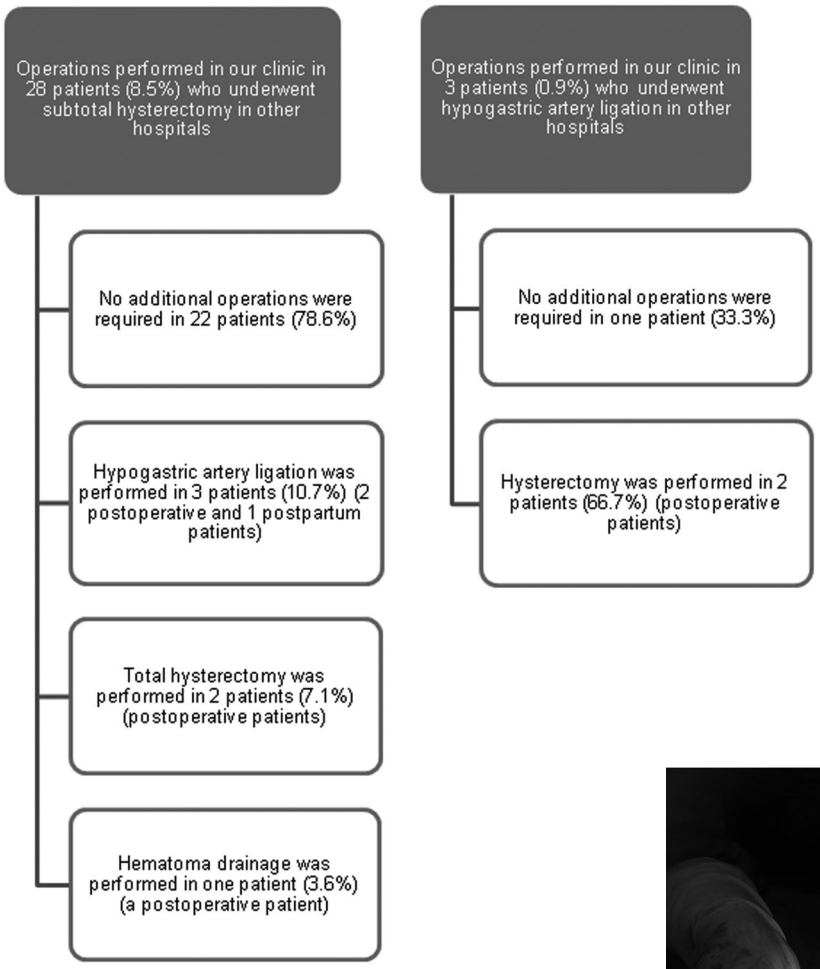

Figure 3. — Patients who were operated in other hospitals and referred to the present hospital for follow-up.

Figure 4. — Hypogastric artery ligation in a patient who underwent hysterectomy in another hospital.

only' was performed in one patient ($p = 0.001$) (Table 3).

Of 330 patients, 60 (18.2%) underwent surgery and 270 (81.8%) received medical treatment in the present clinic. In addition, 31 patients (9.4%) underwent an urgent operation in another hospital following a vaginal delivery or C-section and were referred to the present clinic for follow-up. Of these 31 patients, 8 (25.8%) underwent relaparotomy in our clinic after their referral. Relaparotomy was performed due to bleeding and hematoma in six patients (75%) and uterine atony in two patients (25%).

Of the aforementioned 31 patients, 28 underwent subtotal hysterectomy and three underwent hypogastric artery ligation in another hospital prior to their referral. Twenty-two of the 28 patients who underwent subtotal hysterectomy required no additional operations in the present clinic; however, hematoma drainage (n=1), total hysterectomy (n-2), and hypogastric artery ligation (n=3) were performed in the remaining patients. On the other hand, among three patients who underwent hypogastric artery ligation, one required no additional operations whereas the other two required hysterectomy (Figure 3).

In eight (25.8%) patients who underwent relaparotomy in the present clinic, seven (87.5%) were in the postoperative group and one (12.5%) was in the postpartum group. There was a significant difference between the groups with regards to the requirement of relaparotomy ($p = 0.007$). In the relaparotomy group, C-section was performed due to the history of previous C-sections in three patients (37.5%), abnormal labor progress in one patient (12.5%), placental abruption in two patients (25%), and antenatal bleeding in one patient (12.5%). Furthermore, one patient (12.5%) who underwent hysterectomy in another hospital due to postpartum uterine atony had hypogastric artery ligation in the

present clinic due to bleeding (Figure 4).

Discussion

In this study, no significant difference was found between complicated vaginal and cesarean deliveries with regards to general laboratory data and maternal morbidity and mortality rates. Overall complication rates in C-sections and normal vaginal deliveries were compared several times before. However, to the best of the present authors' knowledge, outcomes of patients with complicated vaginal or cesarean deliveries have not been compared before. It should also be mentioned that although the two groups' mean hemoglobin levels were similar, fresh blood transfusion required in the present hospital was found to be significantly higher in the postoperative group compared to the postpartum group, which was a unique property of the present study. It was also found that the two groups' maternal outcomes were similar after delivery, except for the requirement of hysterectomy. Requirement of hysterectomy was significantly higher in the postoperative group compared to the postpartum group. The higher requirement of hysterectomy might have also led to higher requirement of fresh blood transfusion.

In the present study, requirement of relaparotomy was found to be significantly higher in the C-section group. Relaparotomy was performed due to bleeding and hematoma in 75% of the patients and uterine atony in 25% of the patients. In their study of four years, Sak *et al.* [9] reported that the incidence of relaparotomy due to bleeding/hematoma and postpartum atony was 70% and 10%, respectively. In another study, Raagab *et al.* [10] reported that relaparotomy was performed due to intra-abdominal hemorrhage in 41.7% of the patients, hematoma in 29.2% of the patients, and postpartum bleeding in 29.2% of the patients. In addition, a history of giving birth to a fetus heavier than 4,000 grams and placenta praevia were listed among the main risk factors for relaparotomy. A history of previous C-section was not considered a risk factor in their study. On the other hand, a history of previous C-section was found to be the highest risk factor in the present study.

In their study, Kessous *et al.* [11] listed risk factors for relaparotomy as follows: postpartum bleeding, cervical tears, placenta praevia, uterine rupture, placental abruption, severe preeclampsia, and history of previous C-section. They also reported that bleeding was accountable for relaparotomy in 70% of the patients. In the present study, C-section was found to be the main risk factor among relaparotomy patients. Furthermore, repeat cesarean was the most frequent indication among patients who underwent relaparotomy after a C-section. In agreement with the literature, relaparotomy was performed due to bleeding and hematoma in 75% of the patients.

The main indications for C-section include dystocia (inadequate uterine activity), history of previous C-section, pelvic posture of the fetus, fetal distress (suffering), intrauterine fetal growth, post-term pregnancy, multiple pregnancy, late parity, and reduced use of vacuum and forceps [12]. In fact, all these indications pose complication risks after delivery. Interestingly, placenta previa was not an indication for C-section in the present study, which might have been due to the tendency of Turkish obstetricians to refer such cases to tertiary care centers prior to an operation.

In a study which compared maternal and perinatal mortality and short term maternal and perinatal outcomes of C-sections (n=537) to those of vaginal deliveries (n=582), it was found that short term maternal complications were more frequent in C-sections compared to spontaneous vaginal deliveries; however, no significant difference was found between the groups in perinatal mortality and morbidity [13]. Bodner *et al.* compared maternal and neonatal morbidity associated with elective C-sections versus planned vaginal delivery in a sample of low-risk obstetric women and reported increased maternal morbidity in elective C-sections including puerperal febrile morbidity and wound infections as well as breastfeeding problems in the postpartum period [14]. In the present study, on the other hand, the most frequent morbidity was found to be acute renal failure in both groups which was present in 21.7% of the postoperative group and 40% of the postpartum group. In a large study on 43,842 deliveries, C-section was compared to vaginal delivery and found to be associated with a 3.01-fold increase in the maternal mortality risk [15]. In another study, maternal mortality was found to be 5.5 times higher in the C-section group compared to the vaginal delivery group [16]. Interestingly, it was reported that the C-section rates were not significantly associated with infant or maternal mortality rates in countries with C-section rates greater than 15% [17]. In the present country, the C-section rate was reported to be around 30% [18]. This might be one of the reasons that the authors could not demonstrate any difference in maternal mortality rates between complicated cesarean and vaginal deliveries.

Bleeding is one of the major complications of delivery. In this respect, the present authors did not find any significant difference between the two groups in hemoglobin levels; however, blood transfusion requirements which indicate the severity of bleeding were significantly different between the groups. In a study on low-risk obstetric women, significant blood loss (> 500 ml) was reported to be more common among patients who had a C-section; however, in agreement with the results of the present study, postpartum hemoglobin levels were not found to be significantly different between the groups [14]. In another study, blood transfusion requirements were found to be 1.4%, 4.7%, and 1.0 % in spontaneous vaginal deliveries, intrapartum C-sections and pre-labor C-sections, respectively [19]. As the participants of the present study were all complicated cases, blood trans-

fusion requirements went up to 12.1% and 7.3% in C-sections and vaginal deliveries, respectively, and the difference between the groups was found to be statistically significant. In a study on 76,938 live births, Ibrahim *et al.* reported 67 postpartum hysterectomies, with an overall incidence of 0.87/1000 [20]. Similarly, in another study, 19 cases of peripartum hysterectomy were reported in 78,961 deliveries, with an incidence of one in 4,156 (0.02%). It was also stated that among 19 cases 95% gave birth by a C-section and 89% had a history of one or more previous C-sections [21]. In a study that was conducted in the United States, a fast growing trend in peripartum hysterectomy (PH) secondary to uterine atony was reported, which was largely explained by the increasing frequency of primary and repeat cesareans [22]. In another population-based study which was conducted in China with the aim of identifying independent risk factors for peripartum hysterectomy, 64 cases of PH were reported in 34,014 deliveries (0.2%), and placenta previa, repeat C-section and multiparity were found to be the risk factors for PH [23]. However, there are no data in the literature regarding the frequency of hysterectomy among complicated deliveries. In the present study, postoperative hysterectomy was performed in 6.3% of the complicated cases. All of the 'hysterectomy only' cases were from the C-section group, and the main indications for hysterectomy were placental abruption, HELLP syndrome, and antenatal bleeding. In the postpartum group, on the other hand, 'hysterectomy+hypogastric artery ligation' was performed due to uterine atony and bleeding. One of the most important findings of the present study was the higher requirement of hysterectomy among complicated postoperative cases. Therefore, surgeons should be mindful of this complication which may result in increased morbidity and mortality among mothers who undergo a C-section.

In a recent study on a total of 2,291 patients, three maternal deaths and 400 cases of severe maternal morbidity (17.5%) were reported. In addition, C-section in the current pregnancy was found to be significantly associated with severe maternal morbidity [24].

In a cross-sectional epidemiological survey on 78,166 cases, a total of 388 women (0.5%) were reported to have died during labor or in the immediate postpartum period. The most common reported causes of maternal death were postpartum haemorrhage, hypertensive complications, and indirect causes much represented by anemia. A total of 1,493 women (1.9%) had a blood transfusion or hysterectomy requirement [19]. In addition, the risk of maternal mortality and/or morbidity was found to be higher in the intrapartum cesarean group compared to the spontaneous vaginal delivery group [19]. Villar *et al.* reported that cesarean delivery, either intrapartum or elective, independent of the demographic and clinical characteristics or experience of pregnancy, doubled the risk of severe maternal morbidity and mortality (including death, hysterectomy, blood transfusion and admission to intensive care unit) compared to vaginal delivery [25]. In the present study, morbidity rates were 8.1% and 11.1% in postoperative and postpartum groups, respectively. These relatively higher rates can be explained by the fact that the study population was comprised of complicated cases.

This study had some limitations. Firstly, it was a small study, and the baseline frequency for some outcomes was so low that an exact statistical analysis could not be conducted. Secondly, the groups' neonatal outcomes were not compared, which could have been an important end point in deliveries since the babies were not born in the present hospital.

In conclusion, the two groups' maternal morbidity and mortality rates were similar in the early follow-up after cesarean and vaginal deliveries, without any advantage of one group to the other. Therefore, the mode of delivery should be selected according to the overall health status of the patient and indications for C-section, keeping in mind that the mode of delivery does not affect the maternal outcomes in the presence of complications. It is also useful to bear in mind that higher requirements of hysterectomy and fresh blood transfusion were the undesirable conditions reported in the postoperative group of the present study. In this respect, larger studies are needed to determine both short term and long term effects of the mode of delivery on maternal and neonatal morbidity and mortality rates. Lastly, 25.8% of the patients who were operated in other hospitals and referred to this clinic required additional operations, which increased the mortality and morbidity rates among the study population. Therefore, physicians should be mindful of their roles in following up their patients very closely in the first 24 hours after delivery, be it cesarean or vaginal.

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