

Incidence of Cesarean Section and the Risk of Possible Surgical Complications After Cesarean Section

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Abstract

Introduction and Objectives: Cesarean section (CS) is one of the most commonly performed surgical procedures globally and has become increasingly prevalent in recent decades. The objective of our study is to evaluate incidence of cesarean sections and the risk of possible surgical complications after cesarean section (CS).

Materials and Methods: During the study period, January 2022 until April 2024 in University Hospital Maternity "Queen Geraldine", 5478 patients underwent cesarean section (CS) surgeries. Data were statistically analyzed.

Results: Latest available data (2010 - 2018) from 154 countries covering 94.5% of world live births show that 21% of women gave birth by caesarean worldwide. Incidence rate of cesarean section (CS) during our study period is 41.5%. Incidence rate of postpartum hemorrhage, endometritis and surgical site infections after cesarean section (CS) during our study period is respectively 1.3%, 1,9%, 0.76%.

Conclusion: Cesarean section (CS) rates continue to increase worldwide. There is growing international concern over the health consequences as CS contributes to increased maternal and prenatal mortality and morbidity. Optimizing the use of CS is a global concern and challenge in public health.

Keywords: Cesarean Section (CS); Postpartum Hemorrhage (PPH); Endometritis (EMM); Surgical Site Infections (SSI)

Introduction

Cesarean delivery defines the birth of a fetus by laparotomy and then hysterotomy. This definition is not applied to removal of the fetus from the abdominal cavity in the case of uterine rupture or of abdominal pregnancy [7].

Worldwide, the average cesarean section (CS) rate increased 19% from 1990 to 2018. The increase was largest in less developed countries (22.9%) and smallest in least developed countries (8.6%). Optimizing the use of CS is of global concern and a challenge in public health [2,3].

According to *BMJ Glob Health* article: Trends and projections of caesarean section rates: global and regional estimates; A total of 154 countries with CS rate records in 2010 or later were included to describe current CS rates worldwide. This represents 94.5% of the world's live births in 2018. The global CS rate was 21.1% with averages of 8.2%, 24.2% and 27.2% in the least, less and more developed regions, respectively [1]. Sub regions with the greatest increases were Eastern Asia, Western Asia and Northern Africa (44.9%, 34.7% and 31.5%, respectively) while sub-Saharan Africa with 3.6% of increase and Northern America with 9.5% of increase had the lowest rise. In Europe, the highest CS rate was found in Romania (46.9%). The projections of CS suggest that, at the current pace, by 2030, 28.5% of women worldwide will give birth by CS (38 million cesareans annually) ranging from 7.1% in sub-Saharan Africa to 63.4% in Eastern Asia [1,3,5].

There is an increasing trend of incidence in Albania, where the incidence of CS in 2017 reached 40.35% compared to the year 2000 where the incidence was only 29.5% [3,6].

In broad terms, cesarean delivery generally has higher maternal surgical risks for the current and subsequent pregnancies compared with spontaneous vaginal birth. Although, in certain circumstances, a cesarean section (CS) may be required to protect the woman and the baby's health [8,9].

The incidence of complications for CS is about 6% for planned CS and 15% for emergency CS [9]. Intra operative or post operative hemorrhage is the most frequent complication of CS, being the cause of 75% of hemorrhages in obstetrics departments [11]. Traditionally, postpartum hemorrhage (PPH) has been defined as greater than 500 ml estimated blood loss in a vaginal delivery as or greater than 1000 ml estimated blood loss at the time of cesarean delivery. This was redefined in 2017 by the American College of Obstetrics and Gynecology (ACOG) as a cumulative blood loss greater than 1000 ml with signs and symptoms of hypovolemia within 24 hours of the birth process, regardless of the route of delivery [15].

Postpartum hemorrhage has a rate of 6.75% in emergency CS compared to 4.74% for planned CS [11]. In 2 - 4% of patients hemotransfusion was administered after cesarean delivery due to hemorrhage [12,15].

Recent studies have shown that the rate of maternal death caused by postpartum sepsis in developing countries accounts for about 10.7%, only second to postpartum hemorrhage [14,16]. Sepsis is a clinical syndrome that results from the dysregulated inflammatory response to infection that leads to organ dysfunction. Surgical site infection (SSI) is one of the most common complications following cesarean section, and has an incidence of 3% - 15% [9,11]. Endometritis (EMM) is the most common maternal infectious complication of childbirth, occurring more commonly after cesarean section than vaginal delivery. In a Cochrane review, the mean incidence of EMM following elective cesarean section was 7% and after non-elective or emergency operations was 30% [17]. Post CS sepsis is the leading reason for hospitalization and the most frequent complication after discharge [14,16].

Materials and Methods

In this study, all methods were performed in accordance with the relevant guidelines and regulations. An attempt was made to identify relevant articles that reported the incidence, impact of cesarean section worldwide and the risk of possible surgical complications after cesarean section. The following electronic databases were searched from: MEDLINE, Pub Med, Ovid, NLM and the Cochrane Library. These data were compared to the data of our retrospective study.

A single-center, non-randomized, retrospective study of the incidence of cesarean section and the risk of possible surgical complications after cesarean section in Maternity "Queen Geraldine" University Hospital, Tirana, Albania. Statistical data from medical records of patients undergoing cesarean section in Maternity "Queen Geraldine", between January 2022 and April 2024, were retrieved and analyzed retrospectively. Postpartum hemorrhage and post operative sepsis in cesarean section in our patients from January 2022 until April 2024 were statistically analyzed.

The licensed version of the statistical program SPSS 26.0 was used to analyze the data. Statistical analysis of indicators was carried out by studying the characteristics of the process under study. Kolmogorov Smirnov test was used to evaluate the statistical significance.

Results

During the study period, January 2022 until April 2024 in University Hospital Maternity “Queen Geraldine”, 5478 patients underwent cesarean section surgeries. The reasons for surgery were emergency CS or planned CS under a medical condition (maternal or fetal criteria for CS). Elective CS on maternal request is not performed in our hospital.

Before surgery, all patients were hospitalized after a thorough clinical examination based on a standard protocol.

Criteria for emergency CS were placental abruption, fetal distress, umbilical cord prolapse, uterine rupture, cephalopelvic disproportion, severe pre-eclampsia, severe bleeding etc.

Criteria for planned CS were breech birth, cephalopelvic disproportion, previous cesarean section, certain birth defects of fetus, active genital herpes, placenta previa, multiple pregnancy, gestational diabetes etc. Planned CS was performed at 39 weeks of pregnancy. The Pfannen Stiel incision was commonly used in CS.

Incidence rate of CS during study period in Albania was compared to the World Health Organization’s (WHO) recommended rate between 10% and 15% [6,13].

In 2022, incidence rate of CS in Albania was 43.5%. During 2023, incidence rate of CS in Albania was 40.9%. In the first 4 months of 2024, incidence rate of CS in Albania was 40%. Average incidence rate of CS during our study period is 41.5%.

Latest available data (2010 - 2018) from 154 countries covering 94.5% of world live births shows that 21% of women gave birth by cesarean section, worldwide [1,2].

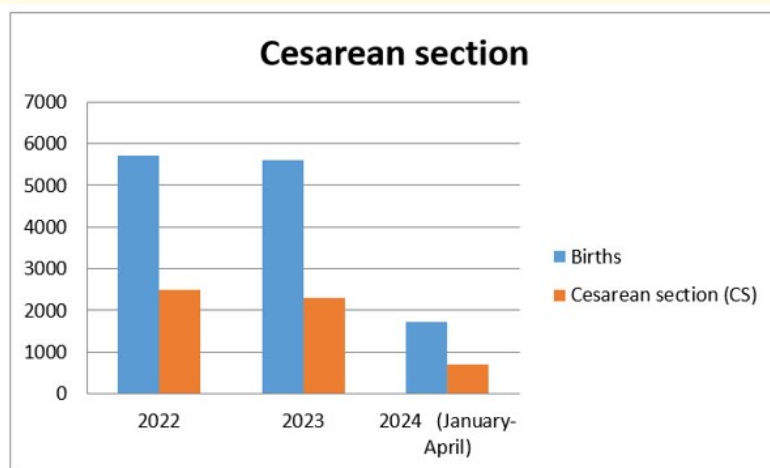


Figure 1: Incidence rate of CS in Albania.

Source: Created by the authors.

The most frequent postoperative complications in University Hospital “Queen Geraldine” were postpartum hemorrhage and post operative sepsis.

The incidence rate of postpartum hemorrhage (PPH) after cesarean section can vary depending on various factors such as the population studied, the definition of PPH used, and the quality of obstetric care provided. Generally, the reported incidence of PPH post cesarean section ranges from around 3% to 5% [11,15].

According to our retrospective study we had these results. In 2022, incidence rate of postpartum hemorrhage (PPH) post CS was 1.9%. During 2023, incidence rate of PPH post CS was 0.7%. In the first 4 months of 2024, incidence rate of PPH was 1.4%. Average incidence rate of PPH during our study period is 1.3%.

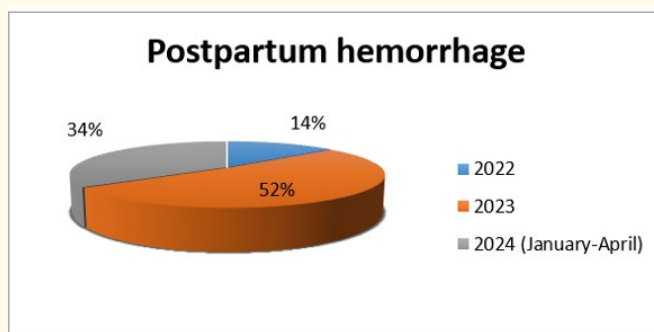


Figure 2: Post partum hemorrhage (PPH) post cesarean section incidence rate.

Source created by the authors.

Endometritis (EMM) post CS can occur in around 1-3% of cesarean deliveries [1,17]. According to our retrospective study we had these results. In 2022, incidence rate of endometritis (EMM) post CS was 0.8%. During 2023, incidence rate of EMM was 3%. In the first 4 months of 2024, incidence rate of EMM was 2%. Average incidence rate of EMM during our study period is 1.9%.

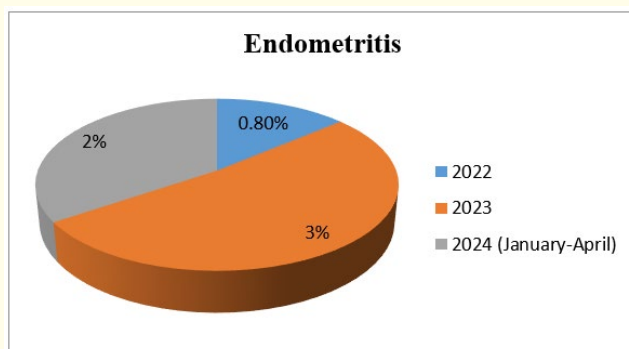


Figure 3: Endometritis post cesarean section incidence rate.

Source created by the authors.

Generally, the reported rates of SSI after cesarean section range from 3% to 15% [9,11]. According to our retrospective study we had these results. In 2022, incidence rate of SSI post CS was 0.4%. During 2023, incidence rate of SSI was 1%. In the first 4 months of 2024, incidence rate of SSI was 0.9%. Average incidence rate of SSI during our study period is 0.76%.

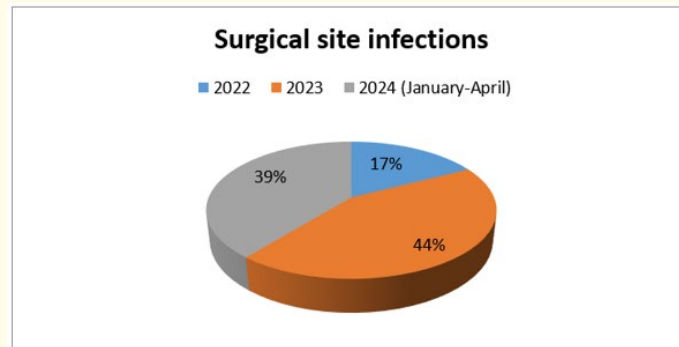


Figure 4: Surgical site infection (SSI) post cesarian section incidence rate.

Source created by the authors.

Kolmogorov Smirnov test was used to evaluate the statistical significance. Comparing years 2022 and 2023, we concluded that births were decreased by 2%, while cesarean sections were decreased by 8% in 2023.

The processing of the data results in a strong statistical relationship between the number of cesarean sections and the complications of postpartum hemorrhage or endometritis, which is confirmed by level of significance (P-value < 0.05).

Analyzing surgical site infections data, we could not confirm a statistical relationship (P-value > 0.05).

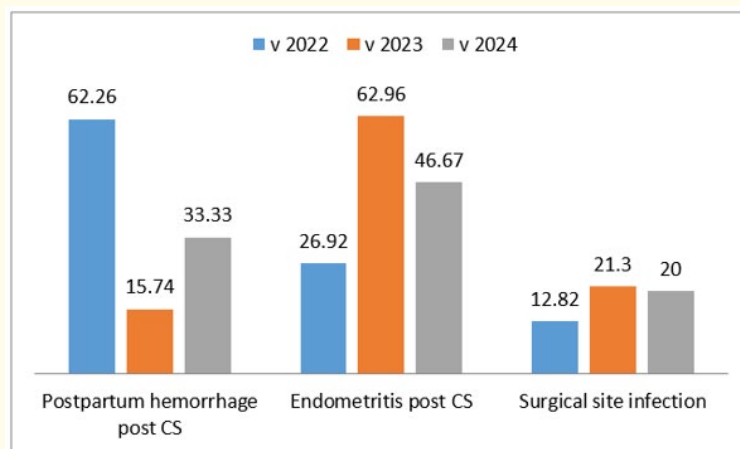


Figure 5: Kolmogorov Smirnov test in complications after CS.

Source created by the authors.

Discussion

Cesarean section is one of the most commonly performed surgical procedures globally and has become increasingly prevalent in recent decades [1].

The present study investigated incidence rate of cesarean sections and its most frequent complications. In the analysis of 5478 patients who underwent cesarean section in University Hospital "Queen Geraldine" from January 2022 until April 2024 was concluded that the average incidence rate of CS is 41.5%. No elective CS on maternal request was done.

According to *BMJ Glob Health* article: Trends and projections of caesarean section rates: global and regional estimate is suggested that the current global CS rate is around 21%. While CS rates have steadily increased worldwide in the last three decades, sub-Saharan Africa continues to present the lowest CS rates and Latin America and the Caribbean remain at the highest. The projection of CS rates to 2021-2030 suggests that by 2030 the global CS rate will be nearing 30% with 38 million CS being performed in 2030 worldwide [1,3,5].

We suggest that our estimated incidence rate is higher compared to the current global CS rate because University Hospital Maternity "Queen Geraldine" is a tertiary hospital which generally, hospitalizes and treats high risk pregnancies referred by regional hospitals in Albania. Furthermore, regional hospitals referring cases to our hospital do not have neonatal intensive care unit (NICU), which has advanced technology and trained healthcare professionals to give special care to newborns.

The findings of this study may contribute to reduce rate of CS in the future. One of our priorities is encouraging women with a history of CS to consider Vaginal Birth After Cesarean (VBAC) if they meet the criteria in order to reduce repeated CS. At the same time, implementing latest evidence-based guidelines for labor management and CS indications will help us reduce CS in the future [12,13].

The most frequent postoperative complications in University Hospital "Queen Geraldine" were postpartum hemorrhage and postpartum sepsis (EMM, SSI).

Intra operative or post operative hemorrhage remains the most frequent complication of CS. The reported global incidence of postpartum hemorrhage (PPH) post cesarean section ranges from around 3% to 5%. PPH post CS has a rate of 6.75% in emergency CS compared to 4.74% for planned CS [11,15]. According to our study, University Hospital "Queen Geraldine", the average incidence rate of PPH post CS is 1.3%. Identifying high-risk patients for PPH through comprehensive prenatal assessments and implementing quality improvement initiatives remain our challenge.

Endometritis (EMM) is 5 - 20 times more frequent in CS compared to vaginal delivery. The rate of endometritis (EMM) is evaluated to be 184 per 1000 in emergency CS and 39 per 1000 in planned CS. Worldwide, EMM post CS can occur in around 1 - 3% of cesarean deliveries [11,14]. According to our study, the average incidence rate of EMM is 1.9%. We can conclude that we have an approximate rate to the current global EMM rate.

Generally, the reported rate of surgical site infection (SSI) post cesarean section range from 3% to 15%. In literature there are 97 wound infections per 1000 in emergency CS and 68 wound infections per 1000 in planned CS [9,11]. According to our study, the average incidence rate of SSI after cesarean section is 0.76%.

However, with proper pre-operative, intra operative, and post operative care, including maintaining a sterile environment, appropriate wound care and the administration of preoperative antibiotics prophylaxis, the risk of SSI can be minimized [16]. It is important for healthcare providers to follow evidence-based guidelines to reduce the incidence of surgical site infections and improve maternal outcomes.

Conclusion

Cesarean section rates continue to increase worldwide. There is growing international concern over the health consequences as CS contributes to increased maternal and prenatal mortality and morbidity. Optimizing the use of CS is a global concern and challenge in public health [5,6,12]. The present study indicates a decrease in CS from 2022 to 2023 by 8%. This is correlated to the decline of births. Significant difference ($P < 0.05$) was observed in complications after CS (postpartum hemorrhage and endometritis). There was no significant difference in surgical site infections.

Disclosure of Interests

The authors express that there is no conflict of interest for the publication of this article.

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