

## Impact of C-Section Rates on Maternal and Child Health: Literature Review Study

Aishah Saleam Alghamdi<sup>1\*</sup>, Jawhara Massaud Alyami<sup>1</sup>, Noha Khairallah Althobaity<sup>1</sup>, Ahad Khalaf Alanazi<sup>1</sup>, Reem Massad Alkhammash<sup>1</sup>, Rawan Khaled Alkholaifi<sup>1</sup>

<sup>1</sup>King Khalid University Hospital, Saudi Arabia

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\*Corresponding author: Aishah Saleam Alghamdi  
King Khalid University Hospital, Saudi Arabia

### Abstract

**Background:** Medically unnecessary cesarean Section is a persistent concern worldwide, exacerbating adverse health outcomes for mothers and infants. Furthermore, global data indicates high rates of cesarean births, exceeding the recommended levels (10-15%) set by the World Health Organization. **Objective:** This literature review aimed to examine the effects of cesarean Section on both the Maternal and Child, in comparison to vaginal delivery. **Methods:** This research was conducted in accordance with the PRISMA guidelines, using the search engines MDPI, PubMed, and Semantic Scholar to identify articles published between 2016 and 2024. As part of the systematic review process, this yielded 599 studies; after screening and assessment, nine studies met the inclusion criteria. As part of the systematic analysis, the researchers examined study characteristics in terms of author, title, objective, sample design, sample size, data collection method, and outcomes. **Results:** The study showed that medically recommended cesarean Section reduces maternal and neonatal morbidity and mortality rates. Unnecessary and medically inadvisable cesarean Section affects both the Maternal and the child, or both. For moms, having a cesarean section raises the chances of having headaches, physical problems, hip pain, trouble doing everyday tasks, and trouble breastfeeding after the child is born. For infants, the effects include respiratory problems, obesity, abnormal behavioral characteristics, and recurrent illnesses. The risk of disrupted feeding and sleeping patterns has also been found to be lower among infants born by cesarean section compared to those born vaginally. Furthermore, the disparity in cesarean Section rates between private and public facilities highlights the influence of social, economic, and institutional factors. **Conclusion:** The high rate of cesarean Section is influenced by complex medical, social, economic, cultural, and institutional factors. While cesarean Section is a life-saving intervention when medically indicated, cesarean Section when medically indicated poses significant health, psychological, and behavioral risks to both Maternals. For infants, the effects include respiratory problems, obesity, abnormal behavioral characteristics, and recurrent illnesses. The risk of disrupted feeding and sleeping patterns has also been found to be lower among infants born by cesarean section compared to those born vaginally.

**Keywords:** Cesarean Section, Vaginal Delivery, Maternal Health, Child Health.

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### INTRODUCTION

A cesarean section is a surgical procedure that involves delivering a child through an incision in the Maternal's abdomen. It is generally recommended when a vaginal delivery would endanger the child and/or the Maternal and the Maternal cannot be saved without a cesarean section (Rahman *et al.*, 2022). A cesarean section may be necessary and life-saving in situations such as prolonged or obstructed labor, fetal distress, high blood pressure or glucose levels, multiple pregnancies, or abnormal fetal position, among others (Angolile *et al.*, 2023). However, it can expose women and infants to unnecessary short- and long-term health risks.

When medically necessary, cesarean section can effectively prevent maternal and neonatal deaths and reduce neonatal morbidities such as birth asphyxia, shoulder delivery, and fractures. Furthermore, in recent years, concerns have been raised about the potential long-term effects of cesarean section on children's health (Wie *et al.*, 2024).

The World Health Organization also confirmed these Caesarean sections can be essential in situations such as prolonged or obstructed labour, fetal distress, or because the child is presenting in an abnormal position. However, as with all surgeries, they can have risks.

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These include the potential for heavy bleeding or infection, slower recovery times after childbirth, delays in establishing breastfeeding and skin-to-skin contact, and increased likelihood of complications in future pregnancies (WHO, 2021).

For many years, this surgical procedure has been performed, both routinely and in emergencies, with proven benefits. When performed according to the appropriate indications, cesarean sections significantly reduce maternal and neonatal morbidity and mortality rates. However, if performed incorrectly, they can be dangerous for both Maternal and Child (Angolile *et al*, 2023).

This literature review explores the impact of C-section rates on maternal and child health, highlighting its significance in modern obstetric care. This study aims to synthesize current research to understand the effects of high rates of cesarean sections, comparing them with vaginal births. For many years, this surgical procedure has been performed, both routinely and in emergencies, with proven benefits. When performed according to the appropriate indications, cesarean sections significantly reduce maternal and neonatal morbidity and mortality rates. The central inquiry question guiding this review is: How do C-section rates affect maternal and infant health compared to vaginal births? By examining models and interventions, this review aims to provide insights into optimizing maternal care practices. In understanding C-section impacts can enhance maternal-child health strategies.

## METHODS

To address the research question on C-section rates, key search terms included "C-section rates," "maternal health," "infant health," "vaginal births," "postpartum complications," and "First Nations women." "C-section rates," "Caesarean section," "Child health," "Maternal outcomes," "Neonatal outcome," "Obstetric complications," "Health disparities .

This review was conducted in accordance with PRISMA guidelines. A literature search was conducted in MDPI, PubMed, and SEMANTIC SCHOLAR for articles published between 2016 and 2024. Focusing on maternal and child health outcomes after Caesarean section. As part of the systematic analysis, the researchers examined study characteristics in terms of study title, date, purpose, sample, study design, results. A total of 500 studies were retrieved from the literature, with an additional 99 records. Manual and cumulative searches of the reference lists of included articles were used, and peer referrals were used. These searches yielded a total of 599 records. After initial screening, which required the removal of duplicates (49), 550 records remained. After additional screening of article titles and abstracts against inclusion and exclusion criteria, 500 records were removed, leaving 50 records. After secondary screening of full articles against inclusion and exclusion criteria, an additional 41 records were excluded, leaving 9 records. These 9 records were individually evaluated by the authors, who helped determine whether they met inclusion criteria. A systematic approach identified studies relevant to the effects of Caesarean section. Each stage of the literature search is summarized in Figure 1

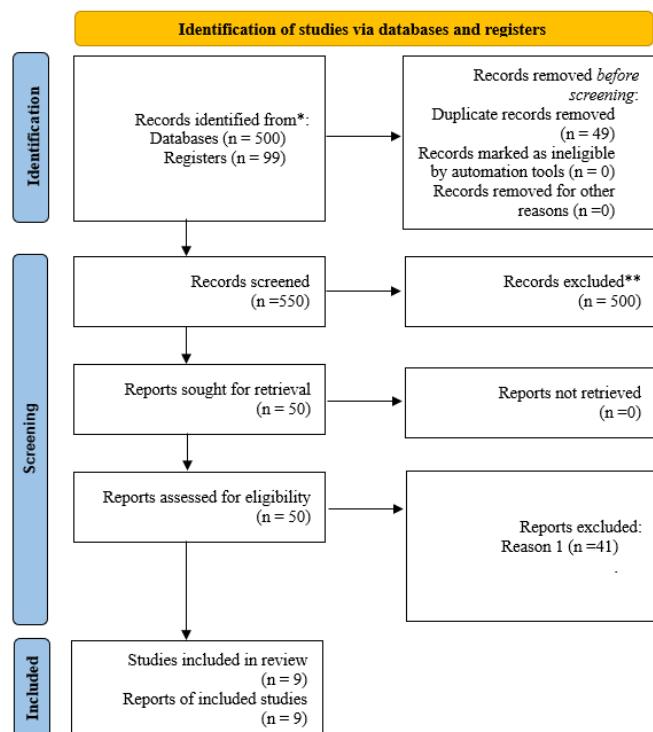


Figure 1: Studies selection summary

## RESULTS

A literature review identified a limited number of studies on models that illustrate the effects of Caesarean section on Maternal and Child (Table 1). Research has emphasized the importance of flexible and culturally sensitive community health services in improving maternal and child care, while highlighting the challenges associated with poor communication and cultural differences. Studies have also shown that Caesarean section rates have increased globally from 7% in 1990 to 21% in 2023, exceeding the ideal rate recommended by the World Health Organization. Some of these are now performed without medical reasons, negatively impacting the health of Maternal and Child.

Research shows that cesarean deliveries are associated with increased health and behavioral problems for Maternals, such as postpartum pain and breastfeeding difficulties, and for children, such as breathing problems and abnormal behaviors. The method

of delivery also affects breastfeeding, with studies showing that planned cesarean deliveries reduce the initiation and continuation of breastfeeding compared to vaginal deliveries.

The quality of healthcare facilities plays an important role in the high rates of cesarean deliveries, with rates higher in private clinics than in public ones, and the geographic distribution of healthcare services having a greater impact on the quality of care. Studies have also indicated a relationship between cesarean deliveries and maternal mental health, as they may lead to post-traumatic stress disorder and depression, which are reflected in children's behavior.

The literature also emphasizes the need to develop effective health information systems to document data and monitor maternal and child health, contributing to improved service quality and evidence-based decision-making .

**Table 1: Included studies summary**

Author and title	Aim	Design	Sample and sample size	Data collection method	Results
Models and Interventions to Promote and Support Engagement of First Nations Women with Maternal and Child Health Services: An Integrative Literature Review (Austin <i>et al.</i> , 2022)	The objective is to identify the factors that support or hinder the engagement of First Nations women with children from birth to five years.	The study used an integrative literature review approach to systematically search, critique, and summarize relevant literature.	the final sample size for the review was 6 records that met all inclusion criteria after further review.	An integrative review was undertaken of full-text, peer-reviewed journal articles and grey literature, which were analyses to identify barriers and enabling factors that influenced the engagement of First Nations families with MCH services.	<p>The review identified several enabling factors that influenced the engagement of First Nations families with MCH services, such as:</p> <ul style="list-style-type: none"> <li>- Timely and appropriate service models or interventions</li> <li>- Effective integrated community-based services that are flexible in their approach</li> <li>- Holistic service models or interventions</li> <li>- Culturally strong service models or interventions</li> <li>- Service models or interventions that encourage earlier identification of risk and need for further assessment, intervention, referral, and support</li> </ul> <p>The review also identified barriers to engagement, including:</p> <ul style="list-style-type: none"> <li>- Inefficient communication and lack of</li> </ul>

Author and title	Aim	Design	Sample and sample size	Data collection method	Results
					<p>understanding between clients and providers</p> <ul style="list-style-type: none"> <li>- Cultural differences between clients and providers</li> <li>- Poor continuity of care between services</li> <li>- Lack of flexibility in service delivery to meet individual needs</li> <li>- A health care model that does not recognize the importance of social determinants of health and well-being</li> </ul>
Association between rates of caesarean section and maternal and neonatal mortality in the 21 <sup>st</sup> century: a worldwide population-based ecological study with longitudinal data. (Ye <i>et al</i> , 2016)	The study aims to identify the appropriate caesarean section rate associated with the lowest maternal and neonatal mortality.	Ecological study using longitudinal data.	A total of 159 countries were included in the analyses, representing 98.0% of Global Live Births (2005).	Nationally representative caesarean section rates from 2000 to 2012 were compiled. We assessed the relationship between caesarean section rates and mortality outcomes, adjusting for socio-economic development by means of human development index (HDI) using fractional polynomial regression models	Most countries have experienced increases in caesarean section rate during the study period. In the unadjusted analysis, there was a negative association between caesarean section rates and mortality outcomes for low caesarean section rates, especially among the least developed countries. After adjusting for HDI, this effect was much smaller and was only observed below a caesarean section rate of 5–10%. No important association between the caesarean section rate and maternal and neonatal mortality was observed when the caesarean section rate exceeded 10%.
Long-term effects of caesarean delivery on health and behavioural outcomes of the Maternal and Child in Bangladesh. (Rahman <i>et al</i> , 2022)	To investigate the associations between medically unnecessary caesarean sections (CS) and various health and behavioral outcomes for Maternals and their children in Bangladesh.	Community-based case-control study. Conducted from May to August 2019.	The study included Maternal and Child dyads. Sample Size: A total of 600 dyads were interviewed, with 300 Maternals who had caesarean sections (CS) and 300 Maternals who had vaginal deliveries (VD) in	conducted a community-based case-control study from May to August 2019. A total of 600 Maternal and Child dyads were interviewed using a structured questionnaire, 300 of them had CS, and 300 had vaginal	The mean age and weight of Maternals were 25.1 years and 53.1 kg, respectively. Likelihoods of headache, after delivery hip pain, problem of daily activities, and breastfeeding problem were reported higher

Author and title	Aim	Design	Sample and sample size	Data collection method	Results
			their most recent live births.	delivery (VD) in their most recent live births. The exposure variable was the mode of delivery, classified as 1 if Maternals had CS and 0 if Maternals had VD. The outcome variables were a group of health and behavioural problems of the Maternals and their children. Multivariate or multiple logistic regression model, separately for each health and behavioural outcome, was used to determine the effect of exposure variable on outcome variable after adjusting for possible confounders.	among Maternals who had CS in their most recent live birth than Maternals who had VD. Similarly, children who were born through the CS operation were more likely to report breathing problem, frequent illness, lower food demand and lower hours of sleeping.
The effect of cesarean section on the initiation and duration of breastfeeding and its difficulties in the first four months after birth. (Hobbs <i>et al.</i> , 2016)	The study aimed to examine the impact of the mode of delivery (vaginal delivery, planned c-section, and emergency c-section) on breastfeeding initiation, duration, and difficulties reported by Maternals at 4 months postpartum.	Prospective pregnancy cohort study. The study began in 2008, with participants completing questionnaires at <25 weeks and 34-36 weeks of gestation, and approximately 4 months postpartum.	Women giving birth to singleton infants. Sample Size: A total of 3,021 participants were included in the study.	study is a prospective pregnancy cohort in Calgary, Alberta, that began in 2008. Participants completed questionnaires at <25 and 34-36 weeks gestation and approximately 4 months postpartum. Demographic, mental health, lifestyle, and health services data were obtained. Women giving birth to singleton infants were included (n = 3021). Breastfeeding rates and difficulties according to mode of birth (vaginal, planned c-section and emergency c-section) were compared using cross-tabulations and chi-square tests. A multivariable logistic regression model was created	More women who delivered by planned c-section had no intention to breastfeed or did not initiate breastfeeding (7.4 % and 4.3 % respectively), when compared to women with vaginal births (3.4 % and 1.8%, respectively) and emergency c-section (2.7% and 2.5%, respectively). Women who delivered by emergency c-section were found to have a higher proportion of breastfeeding difficulties (41%), and used more resources before (67%) and after (58%) leaving the hospital, when compared to vaginal delivery (29%, 40%, and 52%, respectively) or planned c-sections (33%, 49%, and 41%, respectively).

Author and title	Aim	Design	Sample and sample size	Data collection method	Results
				to examine the association between mode of birth on breastfeeding duration to 12 weeks postpartum.	Women who delivered with a planned c-section were more likely (OR = 1.61; 95% CI: 1.14, 2.26; p = 0.014) to discontinue breastfeeding before 12 weeks postpartum compared to those who delivered vaginally, controlling for income, education, parity, preterm birth, maternal physical and mental health, ethnicity and breastfeeding difficulties.
Long-term Health Outcomes of Children Born by Cesarean Section: A Nationwide Population-Based Retrospective Cohort Study in Taiwan (Wei <i>et al.</i> , 2024)	This study aimed to clarify whether small child, obesity, and respiratory infections in children are associated with delivery methods.	(Population-based cohort study and registry-based retrospective study).	Secondary analysis of data previously recorded in a National Comprehensive Database (NHIRD), i.e., archival data/electronic records	All infants born between January 1, 2004, and December 31, 2013, were identified from the TMCHD. The selected infants were divided into two groups: infants with cesarean section syndrome and infants with celiac disease. Infant demographic characteristics, including birth weight, gestational age, and sex, were recorded.	This study indicated that infants born by cesarean section are more likely to develop respiratory infections, asthma, allergic rhinitis, atopic dermatitis, and obesity compared to infants born vaginally. Of these conditions, obesity is most strongly associated with Caesarean section.
Rates of instrumental vaginal birth and cesarean and quality of maternal and newborn health care in private versus public facilities: Results of the IMAgiNE EURO study in 16 countries. (Lazzerini <i>et al.</i> , 2022)	To explore the quality of maternal and newborn care (QMNC) during the COVID-19 pandemic by facility type among 16 European countries, comparing rates of instrumental vaginal birth and cesarean.	study is a cross-sectional study reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies. <sup>29</sup> The STROBE checklist is included as supporting information	Out of 49866 women accessing the online questionnaire, 41536 women met the inclusion criteria. A total of 25206 were included in the analysis after exclusion of cases missing information on the 40 WHO standards-based quality measures or on key sociodemographic variables, type of hospital, or suspected duplicates.	Women who gave birth in the WHO European Region from March 1, 2020, to February 7, 2022, answered a validated online questionnaire. Rates of instrumental birth, instrumental vaginal birth, and cesarean, and a QMNC index were calculated for births in public versus private facilities.	Responses from 25206 participants were analyzed. Women giving birth in private compared with public facilities reported significantly more frequent total cesarean (32.5% vs 19.0%; aOR 1.70; 95% CI 1.52-1.90), elective cesarean (17.3% vs 7.8%; aOR 1.90; 95% CI 1.65-2.19), and emergency cesarean before labor (7.4% vs 3.9%; aOR 1.39; 95% CI 1.14-1.70) (P <0.001 for all comparisons), with analyses by country confirming these

Author and title	Aim	Design	Sample and sample size	Data collection method	Results
					results. QMNC index results were heterogeneous across countries and regions in the same country and were largely affected by geographical distribution of regions rather than by type of facility alone.
The Association between Cesarean Section Delivery and Child Behavior: Is It Mediated by Maternal Post-Traumatic Stress Disorder and Maternal Postpartum Depression. (Grisbrook <i>et al.</i> , 2024)	This study aimed to provide a deeper understanding of whether delivery method is associated with child behavioral problems through the pathways of PTSD and postpartum depression.	The APrON study was initially designed to collect data on maternal nutrition and maternal mental health, birth and obstetric outcomes, and child neurodevelopment.	Participants were recruited from a community sample of women living in two large cities in Alberta, Canada, between 2009 and 2012.	Data from this study were drawn from the Alberta Pregnancy Outcomes and Nutrition (APrON) longitudinal pregnancy cohort study.	Demographic data and maternal and child characteristics are presented in Of the 938 Maternal-infant dyads who participated in the study, 19% delivered by emergency cesarean section. The mean maternal age was 32 years, most Maternals were married (97%), had a household income >\$70,000 CAD (84%), and had post-secondary education (76%). More than half of the children were male (52%). Of the 938 Maternals, 6.1% had PTSD scores $\geq 12$ , 3.5% had PTSD scores $\geq 5$ , and 1.2% had both PTSD and high PTSD scores.
Global increased cesarean section rates and public health implications: A call to action. (Angolile <i>et al.</i> , 2023)	The study aims to highlight the global increase in caesarean section rates, discuss its public health implications, and call for action to address the unjustified use of caesarean section by raising awareness among health professionals and the general public.	Analytical review and call to action formula (narrative commentary/call to action)	It covers data and indicators from a global perspective, including cesarean section rates, related studies, and statistical data from sources such as the World Health Organization.	Review literature and previous publications, review global reports and health statistics (such as WHO reports), and analyze current and future trends in cesarean section rates and future projections.	Global cesarean section rates have increased from approximately 7% in 1990 to approximately 21% in 2023, exceeding the acceptable range of 10%–15% recommended by the World Health Organization. There is a clear trend toward an increase in unjustified cesareans, even those performed at the Maternal's request, and the study warns that this trend will continue during the current decade, with the

Author and title	Aim	Design	Sample and sample size	Data collection method	Results
					cesarean section rate projected to reach 29% by 2030. The study highlights that cesareans under appropriate medical justification reduce maternal and neonatal mortality, but they carry short- and long-term health risks when performed unnecessarily, and may increase the risk of non-communicable diseases and immune disorders in children.
Recording and Reporting Information System for Maternal Health Monitoring (Literature Review). (Dustar <i>et al.</i> , 2023)	aims to improve the health and welfare of Maternals and children as stated in Permenkes number 4 of 2019. To support the implementation of the program requires technology in the form of information systems.	Information systems are designed to help information system is needed to run optimally. The purpose of this study was to describe the recording and reporting of maternal health monitoring activities.	12 articles that were in accordance with the issues raised	The method used is a literature review based on the PRISMA flow.	The results of the health information system research are able to provide the right, accurate and up-to- date quality of information data so as to improve the efficiency and effectiveness of services and facilitate evaluation and help health workers manage maternal health more effectively.

## DISCUSSION

Health services have a significant impact maternal and child health during or before birth. Among the most important of these services, as mentioned in the study by Austin *et al* (2022). Are timely interventions, flexible community services, and comprehensive and culturally robust treatment models. One of the most important things is what everyone worldwide expects from a rapid increase in caesarean section services for children. Over the years, global cesarean section rates have increased dramatically, from approximately 7% in 1990 to 21% in 2023, exceeding the accepted ideal cesarean rate of 10% to 15% according to the World Health Organization (Angolile *et al.*, 2023). However, not all cesarean sections are currently performed for medical reasons, with a rapid increase in the rate of non-medically indicated cesareans and so-called "maternally requested cesarean.

Socioeconomic conditions, cultural factors, and health system factors significantly influence both cesarean section rates and maternal and neonatal mortality rates (Ye. *et al.*, 2016). For instance, Lazzerini *et al* (2022) found that the type of healthcare facility plays a significant role in determining Caesarean section

rates. Women who delivered in private clinics had a higher Caesarean section rate than their counterparts in public clinics, with the overall Caesarean section rate in private clinics reaching 32.5% compared to 19.0% in public clinics. This suggests that financial incentives or institutional policies may be an underlying driver behind the high rates of cesarean sections in the private sector. Importantly, maternal and child health quality was found to be more affected by geographical disparities and unequal distribution of services than by whether birth occurred in the public or private sector.

Studies confirm that cesarean sections have a negative impact on the Maternal. A study (Rahman *et al.*, 2022) reported a higher risk of headaches, postpartum hip pain, difficulty performing daily activities, physical problems, and breastfeeding difficulties in Maternals who underwent cesarean sections compared to Maternals who had vaginal deliveries. These complications underscore the importance of ensuring that cesarean sections are medically justified and followed by appropriate maternal support services.

Caesarean delivery not only affects Maternals but also has long-term effects on infants Rahman *et al*

(2022) noted an increased risk of respiratory problems, recurrent illness, and abnormal behavioral characteristics. The risk of normal feeding and sleeping patterns was also found to be lower among infants delivered by cesarean section compared to infants delivered vaginally. Complementing this, Grisbrook *et al* (2024) emphasized the findings suggest a potential pathway whereby the psychological impact of Caesarean section may influence maternal mental health, which in turn impacts child behavior. This perspective is consistent with previous studies that emphasize the importance of maternal mental health in shaping child development trajectories. Conversely, Gressbrook's study directly links delivery method to psychological outcomes and, ultimately, child behavior. This highlights the indirect, but crucial, role of maternal mental health in shaping a child's development.

Several studies demonstrate a strong link between delivery method and breastfeeding success, Hobbs *et al* (2016) found that women who had a planned cesarean section were more likely to stop breastfeeding before 12 weeks postpartum compared to those who had a vaginal delivery, after adjusting for income, education, parity, preterm birth, maternal physical and mental health, ethnicity, and breastfeeding difficulties. The study results also showed that planned cesarean deliveries were associated with lower breastfeeding success in the first four months postpartum, compared to vaginal deliveries. In particular, we add to the growing body of evidence that planned cesarean deliveries negatively impact breastfeeding initiation and duration.

Improving maternal and child health outcomes is not limited to clinical interventions, but also depends on effective information systems. Dustar *et al* (2023) highlighted that the importance of effective recording and reporting systems for monitoring maternal health, information systems in facilitating accurate data collection, enabling better service delivery and evaluation processes. Systematic data management can enhance the efficiency and effectiveness of maternal and child health services. Help healthcare providers make informed decisions, to ensure service delivery. When combined late, these electrons can help planners accurately monitor the tranches, avoid discrepancies, and prevent decisions such as elective cesarean sections (Dustar *et al.*, 2023).

Community-based, studies indicate that the prevalence of large infants in cesarean sections is not only influenced by medical needs, but also by social and institutional factors. While cesarean sections can be life-saving in some cases, they can also be performed by maternals with postpartum complications and negatively impact child health and breastfeeding. Furthermore, evidence suggests that negative effects and the lack of a system exacerbate these outcomes. Therefore, efforts to reduce cesarean deliveries should focus on non-specific,

postpartum interventions, and health information systems to monitor maternal health services.

## CONCLUSION

The evidence demonstrates that high rates of cesarean deliveries are driven by a complex interplay of medical, cultural, socioeconomic, and institutional factors. While cesarean sections remain a life-saving intervention when medically necessary, their overuse poses considerable risks for both mothers and infants, including postpartum complications, breastfeeding difficulties, and long-term health vulnerabilities. For infants, the procedure is associated with respiratory problems, obesity, allergic disorders, and adverse behavioral outcomes. Variations between public and private facilities further highlight the influence of social and organizational determinants in decision-making.

To address these challenges, health systems must regulate the use of cesarean sections, ensuring that the procedure is performed strictly on medical grounds. Strengthening maternal and child healthcare services, enhancing health information systems, and promoting awareness among healthcare providers and mothers are essential steps. By adopting evidence-based policies, it is possible to reduce unnecessary cesarean deliveries and improve overall maternal and child health outcomes.

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