Aus dem Fachbereich Medizin
der Philipps-Universität Marburg

ADRESSING THE CAESAREAN SECTION EPIDEMIC AND DEALING WITH ITS COMPLICATIONS

Inaugural-Dissertation
zur Erlangung des Doktorgrades Medizinwissenschaften
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vorgelegt der Medizinischen Fakultät
der Philipps-Universität Marburg

von
Dianita Sugiyo
aus Madiun, Indonesien

Marburg, 2025

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Titel der Dissertation:

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Lists of abbreviations

NHI : National Health Insurance
CS : Cesarean Section
VBAC : Vaginal Birth After Cesarean Section
LUS : Lower Uterine Segment
JBI : Joanna Briggs Institute's
MeSH : Medical Subject Headings
RMT : Residual Myometrial Thickness
ICC : Intra-class Correlation Coefficient
MTCT : Mother-to-child transmission
ECS : Elective Cesarean Section
CSMR : Cesarean Section upon Maternal Request
BMI : Body Mass Index

Introduction

Background

The Healthcare and Social Security Agency was established to implement the National Health Insurance (NHI) program in Indonesia, following the enactment of national laws regarding the social security system (Law numbers: 24 [2011] and 40 [2004]). The NHI program encompasses maternal healthcare expenses for services such as antenatal care, birth, postpartum hemorrhage management, contraception, postnatal care, vaginal delivery, and newborn health services (Andalas et al., 2020; Teplitskaya et al., 2018).

The global incidence of Cesarean Section (CS) deliveries is rising and is anticipated to persist in its upward trend (Betran et al., 2021). In China, most women undergo cesarean deliveries in hospitals, despite the absence of medical indications for this method of childbirth (Liang et al., 2018). The CS rate in China rose from 29% to 35% between 2008 and 2014. Moreover, women with a history of CS could have several long-term complications, such as bleeding disorders, pelvic pain, subfertility, and placenta accreta spectrum in a subsequent pregnancy (Sandall et al., 2018; Wang et al., 2009). Pregnant women aiming to proceed with vaginal birth after CS (VBAC) are faced with another major concern of uterine rupture and dehiscence (Finnsdottir et al., 2023) , and this concern leads to increasing numbers of repeat CS in Germany (30%) (Kehl et al., 2025).

The World Health Organization recommend a CS rate between 10% and 15%. In Indonesia, the incidence of CS has risen since the introduction of NHI. The rate of CS in government hospitals rose by 13.29% from 41,07% between 2011-2013 to 54.35% between 2014-2016 (the start of NHI implementation) (Andalas et al., 2020). The rising rates of CS result in universal coverage limitations, particularly with the financing of increasingly critical healthcare treatments. This effect is intensified when the financial burden of a CS on the hospital funding system is considered. Generally, hospital claims for CS are lower than the payments made by the Indonesia Case-Based Group (Sungkar et al., 2019).

Problem Statement

The aim of this study was to examine the influence of various financial strategies on the cost management of cesarean deliveries within health coverage schemes. Moreover, we aimed to access the characteristic of sonographic lower uterine segment (LUS) after CS and to analyze the association of the sonographic measures with successful VBAC.

Research question

Two important aspects of increasing CS rates discussed. Firstly, the strategy for managing the cost overruns associated with health procedures. And the following question is the characteristic of the post-cesarean LUS and its changes during a subsequent pregnancy. Which is further explored as a possible predictor of successful VBAC.

Materials and Methods

Publications

This cumulative dissertation is describing these following two publications:

1. Sugiyo D, Kyvernitakis I, Bahlmann F, Brüggmann D, Al Naimi A. How cesarean section rates can be reduced through an effective financial strategy: A protocol for systematic review. Medicine (Baltimore). 2025 Jan 3;104(1):e41104. doi: 10.1097/MD.0000000000041104. PMID: 40184147; PMCID: PMC11709202.
2. Spahn S, Horky A, Sugiyo D, Bahlmann F, Al Naimi A. The prospective sonographic assessment of the lower uterine segment after cesarean section and its clinical utility. Arch Gynecol Obstet. 2025 Feb 1. doi: 10.1007/s00404-025-07963-2. Epub ahead of print. PMID: 39893267.

First study

How cesarean section rates can be reduced through an effective financial strategy

A protocol for systematic review

Dianita Sugiyo, MHID[a,b,*] , Ioannis Kyvernitakis, PhD[a,c], Franz Bahlmann, PhD[d], Dörthe Brüggmann, PhD[e], Ammar Al Naimi, PhD[d,e]

Medicine 2025;104:1(e41104).

The Ethical Committee of Universitas Aisyiyah Yogyakarta obtained ethical approval for the first project (reference number: 1934/KEP-UNISA/I/2022). The Joanna Briggs Institute's (JBI) Critical Appraisal Checklist was employed to independently assess methodological quality. This systematic review protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO, URL: https://www.crd.york.ac.uk/prospero/, registration number: CRD42022302901). A meta-synthesis model was employed for qualitative analysis to integrate data, utilizing a meta-aggregative strategy to organize results derived from various research methodologies.

Search Strategy

Five critical phases are involved in executing a systematic review: formulating the research question; identifying relevant literature and systematically selecting articles; evaluating article quality; extracting data; and synthesizing data through compilation, summarization, and reporting of results (Özsu, 2009). This meta-synthesis review encompasses all scientific literature published from January 2017 to December 2021, sourced from the PubMed, ProQuest, and ScienceDirect databases.

The exclusion of gray literature from this study is due to the absence of peer review for unpublished studies. Evaluations found in gray literature and materials may be highly vulnerable to prejudice due to various factors, including inaccuracies and inadequate data.

Moreover, gray literature may contain inaccuracies owing to the lack of a stringent editorial process.

Identifying relevant studies.

This study utilized pertinent keywords derived from the Medical Subject Headings (MeSH): “cost-benefit analysis,” “universal health care,” “cost controls,” “health expenditures,” “out-of-pocket expenses,” “c-section,” and “abdominal delivery.” The keywords were amalgamated into search strings utilizing the Boolean operators "OR" and "AND." One of the search queries employed on PubMed was: (((((((cost-benefit analysis) AND (universal health care) AND (cost controls) AND (health expenditure)) OR (out-of-pocket expenses)) AND (cesarean section)) OR (abdominal delivery)) OR (cesarean section). The identical keywords were employed in the ProQuest and ScienceDirect databases.

Study selection and data extraction

Two investigators independently reviewed titles and abstracts to identify all qualifying papers according to the inclusion criteria. The qualifying studies were then evaluated utilizing the JBI checklist and were incorporated into this review following an independent verification by two reviewers. Disputes among reviewers stemming from divergent perspectives or concepts were addressed through sequential dialogue. Eleven questions were employed for the critical appraisal to determine inclusion in the systematic review, evaluating the following aspects: review questions, suitability of inclusion criteria, employed search strategy, database resources utilized to acquire enough articles, appraisal criteria and process, methodology, publication bias, policy recommendations, and suggestions for further research (Lodge-Tulloch et al., 2021).

Data extraction was conducted to obtain the following information from each article: study aims, study design, study settings, country, year, kind of institution, criteria for CS, and source and completeness of data. Categories of findings are grouped based on their semantic similarity and are subsequently utilized to define themes. Synthesized

conclusions were derived from the categorization established during the final data analysis phase.

Second Study

The prospective sonographic assessment of the lower uterine segment after caesarean section and its clinical utility

Stephan Spahn[1] · Alex Horky[1] · **Dianita Sugiyo[2]** · Franz Bahlmann[1] · Ammar Al Naimi[1,3]

Archives of Gynecology and Obstetrics 2025 Feb 1

Pre- and intra-gestational LUS assessment following CS in a prior pregnancy are the focus of this prospective observational cohort investigation. Patients who experienced their initial CS at a tertiary center were solicited to participate in the study prior to discharge. The inclusion criteria encompassed individuals over 18 years of age with open family planning, while the exclusion criteria were those with completed family planning, a history of any additional uterine procedures (such as myomectomies) apart from the cesarean section, and a vertical or inverted T uterotomy during the cesarean section.
Qualified and consenting women participated in the initial transvaginal sonographic assessment 9-18 months following surgery to evaluate the residual myometrial thickness (RMT) and confirm the existence of a niche. The RMT ratio was determined as a percentage of RMT relative to the thickness of the complete anterior uterine wall.

Intra-class correlation coefficients (ICC) were computed to assess the intra-observer repeatability of the uterine segment measurements. ICC values of 0.8 indicate strong agreement, while absolute agreement is denoted by values approaching 1. Continuous variables were presented as medians and interquartile ranges, and logistic regression was conducted to examine relationships with binomial outcomes. All statistical analyses were performed using Stata® (version 18.0, Texas, USA). This research received approval from the Ethical Committee of the Hessen Regional Medical Council (Reg. Nr. 2019-1138-evBO).

Results

First Study

This review comprised 26 publications published from 2017 to 2021 to guarantee the recency of the findings. The database search yielded 883 prospective articles: ProQuest (n = 507), PubMed (n = 168), and ScienceDirect (n = 168). The titles, abstracts, and whole texts were evaluated to ascertain the study's eligibility. The research encompassed sample sizes varying from 96 to 47,661 people, including women, newborns, mother-child dyads, and stakeholders. Numerous publications addressed the payment systems in low-middle and upper-middle-income nations. The research evidence was rigorously evaluated to assess the study's methodology and the degree to which it mitigated potential biases during analysis. All research findings incorporated in the systematic review were rigorously utilizing JBI systematic review instruments. In the study selection process, the writers incorporated all significant elements and research specifics in the summary conclusions. Following a critical evaluation utilizing the JBI critical appraisal tools, all 26 studies elucidated the research questions, and the inclusion criteria were deemed suitable for the review inquiries. Eleven questions were utilized to critically evaluate each of the research. All studies incorporated in the data extraction were categorized into three principal thematic findings: demographic factors influencing CS; the necessity versus superfluity of increasing CS rates; and effective financial strategies to manage the cost overruns associated with specific health procedures.

Theme 1: Demographic factors influencing c-section

This segment had 47 quotations that provided information on specific maternal circumstances that resulted in the selection of a CS as the mode of delivery.

Overweight.

A study indicated that the likelihood of CS rises by 53% due to the overweight state of expectant mothers, while obesity elevates the risk by 126% (Hoxha, Syrogiannouli, Luta, et al., 2017). This finding aligned with another study that identified a high correlation between obesity and cesarean sections (Kalliala et al., 2017). Women with an elevated

body mass index (BMI) have an increased risk of delivery complications relative to those with a lower BMI. Furthermore, women with increased BMI demonstrated extended durations from decision to delivery and a greater frequency of epidural anesthetic failure relative to their non-obese counterparts.

Mother to children transmission of diseases.

Mother-to-child transmission (MTCT) predominantly occurs during uterine contractions and placental rupture at birth, leading to the micro perfusion of maternal blood into the fetal circulation. Fifteen Elective CS (ECS) is therapeutically advised as a prophylactic measure against the mother-to-child transmission of the hepatitis B virus and human immunodeficiency virus (Kennedy et al., 2017; Yang et al., 2017). A study indicated that ECS markedly diminished maternal morbidity and decreased the incidence of human immunodeficiency virus infections in babies (odds ratio [OR] = 0.2, 95% confidence interval: 0.0–0.5) (Kennedy et al., 2017).

Failed induction.

Unproductive uterine contractions and insufficient cervical modifications for a minimum of one hour following 6 to 8 hours of oxytocin administration or unsuccessful induction are risk factors that elevate CS rates, occurring more frequently in primiparous women than in multiparous moms (Melkie et al., 2021). An poor cervix also results in decisions to conduct cesarean sections, despite the technique being contraindicated for women with uterine scarring utilizing both vaginal prostaglandins and intravenous oxytocin (Dodd et al., 2017).

Other medical concerns.

The decision to conduct ECS was also observed in women belonging to breech presentation groups (Robson groups 6 and 7) (Kingdon et al., 2018b). One study indicated that ECS was more prevalent among singleton pregnant women who utilized assisted reproductive technology compared to those who conceived normally (Lodge-Tulloch et al., 2021).

Theme 2: Is the increasing number of c-sections necessary or unnecessary?

A multitude of reasons contributes to the rising incidence of CS globally, encompassing the determination of whether the procedure was medically warranted or superfluous. The factors contributing to the rising CS rate encompass medical problems, patient choices, and profit-driven motives.

Consideration of financial incentives.

The profit-driven nature of healthcare facilities, particularly hospitals, was linked to a 41% rise in the CS rate (Hoxha, Syrogiannouli, Luta, et al., 2017). This link was noted between financial incentives and the supply factors affecting a certain condition through the quantity and type of treatment provided. CS in private for-profit institutions attributable to financial motivations associated with physicians' remuneration structures. Furthermore, because to the protracted waiting period for vaginal delivery, clinicians faced pressure, both publicly and informally, to advocate for surgical interventions, such as cesarean sections, which enhance profitability. This study also indicated the increasing quantity of and promotes improved time management (Hoxha, Syrogiannouli, Luta, et al., 2017).

C-section per maternal request.

The rise in the incidence of CS can be ascribed to a multitude of intricate factors, encompassing both clinical and nonclinical considerations. These include the preferences of expectant mothers and healthcare providers, apprehensions regarding the experience of labor pain, and societal pressures (Kingdon et al., 2018a). The prevalence of anxiety and apprehension regarding labor pain has significantly impacted the rate of cesarean sections, with the administration of epidural analgesia proposed as a viable method to diminish the occurrence of such surgical interventions (Mędrzycka-Dabrowska et al., 2018; Shirzad et al., 2021). Furthermore, the prevalence of antepartum depression and anxiety is notably elevated in mothers opting for elective CS compared to those selecting vaginal delivery (Olieman et al., 2017). Another rationale for opting for an ECS was the couple's perception of body image, intertwined with the apprehension that the process of

labor might inflict harm upon the genitalia and lead to vaginal relaxation syndrome, characterized by a loss of moisture and elasticity in the vagina (Shirzad et al., 2021).

A further study focused on discussions among stakeholders, maternity care providers, the general public, physicians, and pregnant women, who articulated their views on the autonomous decision-making regarding c-sections among women (Loke et al., 2019). Support for CS upon maternal request (CSMR) varied across countries, with obstetricians showing the highest level of support. Another factor that may contribute to the rising incidence of unnecessary emergency c-sections is the ineffective attempts to mitigate adverse neonatal and maternal outcomes through increased interventions of the precision of electronic fetal heart monitoring methods, including cardiotocography, fetal scalp pH analysis, fetal pulse oximetry, fetal heart electrocardiogram, and computerized cardiotocography (Wattar et al., 2021).

Theme 3: Effective financial strategy to regulate the cost overrun of specific medical procedures

Financial strategy to cope with budget overruns in medical spending.

The existing clinical guidelines are inadequate for addressing the rising rates of CS in numerous healthcare services (Hoxha, Syrogiannouli, Luta, et al., 2017). Therefore, the creation of a clear, evidence-based clinical guideline is considered the initial step in enhancing decision-making within clinical environments. Furthermore, modifying financial incentives and enhancing care objectives through a robust cost strategy are of equal significance. Hospitals should face penalties for not achieving a low CS rate. Financial incentives are anticipated to affect the established correlation. For-profit institutions may implement financial incentive structures that encourage resource-intensive and costly operations to enhance revenue generation. The remuneration structure for hospitals and physicians is a critical determinant. Reimbursement through fee-for-service models is common in private for-profit hospitals, which may encourage these institutions and physicians to perform more procedures than clinically justified. This situation exacerbates time constraints for physicians, leading to a preference for CS over the extended waiting times associated with normal deliveries. Health insurers may encourage the overutilization of cesarean sections, as they frequently provide greater

reimbursement rates to hospitals and physicians for cesarean deliveries compared to vaginal births. Private for-profit hospitals typically possess a higher number of qualified physicians, improved resources, and advanced infrastructure.

Health care centers aim to optimize financial resources, reduce needless c-sections, and improve maternal and newborn health outcomes (Feldhaus & Mathauer, 2018; Hoxha, Syrogiannouli, Luta, et al., 2017). The direct and indirect costs represent a financial burden, as they may be linked to occupancy, surgical complications, and postsurgical care, including rehabilitation (Fujihara et al., 2017). A further strategy to reduce the CS rate involves establishing an equitable reimbursement policy for both vaginal and cesarean deliveries, as increased fees for CS incentivize physicians. Reimbursement arrangements among insurance providers for c-sections should not differentiate payments and should implement a mechanism to address financial burden. Financial management strategies employed by healthcare providers include the prescription of generic medications, the avoidance of unnecessary diagnostic tests, and the prevention of unnecessary admissions to intensive care units (Hoxha, Syrogiannouli, Braha, et al., 2017; Hoxha, Syrogiannouli, Luta, et al., 2017). It has been proposed that reducing the likelihood of vaginal delivery may require a management approach that incorporates risk-sharing and healthcare financing considerations. Furthermore, a separate study indicated that the departments could indirectly mitigate out-of-pocket expenses.

Nonfinancial strategy to overcome budget overruns for medical costs associated with increased c-section rates.

The term "non-financial strategy" refers to various steps that are taken to screen and decide which medical operations should be undertaken to drive efficient spending and limit the number of procedures that could potentially be unneeded. The Robson classification was utilized as a tool for conducting clinical audit cycles aimed at reducing cesarean sections (Boatin et al., 2018). Moreover, alternative factors, including the health delivery system, hospital facilities management, and organizational elements, are recognized to significantly decrease the CS rate. Education contributes to the reduction of anxiety by improving knowledge and altering beliefs, which in turn boosts mothers' confidence during the labor process. Preparation before delivery significantly influences decision-making about the mode of birth for women who have access to various

information sources, sufficient emotional support, and discussions with health professionals through childbirth training workshops and nurse-led relaxation training programs. Maternal assistance programs, including pelvic floor muscle exercises, cognitive behavioral therapy, childbirth education classes, and interactive discussions, do not have a significant impact on c-section rates (Chen et al., 2018). A nonfinancial strategy for decreasing the CS rate involves implementing free maternity policies that facilitate women's access to MTCT disease screening, antenatal vital statistics assessments, perinatal complication mitigation, and immunization coverage (Oyugi et al., 2021).

Second Study

There was a total of 96 women who entered and successfully completed a new pregnancy to be included in the analysis. These women were selected from the one hundred fifty women who were enrolled in the study and who attended the initial pregestational examination. The interval between the initial CS and the first examination was 13 (11-16) months, and all women included in this study conceived within 12 months after the initial assessment.

Pregestational RMT was 62% and 38 (39%) women formed niches. The myometrial thickness exhibited a tapering trend from cranial (D) to caudal (A), and the interquartile ranges for all places diminished as the pregnancy advanced. The assessment of myometrial thickness at all locations demonstrated remarkable repeatability, with an ICC over 0.8 regardless of the trimester.

Twenty-six women (27.1%) underwent an elective repeat CS for various reasons, five of which were attributed to sonographic indications of scar dehiscence due to bulging. Only 4 of those (80%) were verified intraoperatively, whereas 1 (20%) was a false positive. No statistically significant difference was observed in the median lower uterine thickness between women with bulging (8.2, 5, and 2.7 mm) and those without bulging (9.4, 5.6, and 3.1 mm) throughout the first, second, and third trimesters, with p-values of 0.75, 0.63, and 0.7, respectively. The incidence of an unplanned repeat CS in the cohort of women who attempted VBAC was 37.1%, with only one woman experiencing an emergency CS due to uterine rupture. Figure 4 presents a study flow-chart illustrating the mode of delivery.

Univariate logistic regression revealed a statistically significant relationship between LUS thickness in the first trimester and the likelihood of successful VBAC once attempted. An increase of one millimeter in thickness during the first trimester elevated the likelihood of VBAC by 50-120%, contingent upon the measurement employed. This connection diminished with advancing gestational age and became statistically insignificant, with p-values exceeding 0.05. Neither the pregestational RMT ratio nor the existence of a niche correlated with the likelihood of successful VBAC.

Discussion

Significant of the results

This study revealed data endorsing the application of Robson categorization in clinical audit cycles to reduce the incidence of cesarean sections. The alternative strategies for decreasing the rate mostly focused on the application of financial measures at both national and local levels within the hospital setting. The rising global prevalence of CS is widely recognized; yet socioeconomic discrepancies in low- to middle-income nations have resulted in their over utilization in many regions (Arunda et al., 2020). Evidence-based study synthesis highlighted outcome factors influencing the choice to conduct cesarean sections, namely obesity, failed induction, respiratory distress syndrome, mother-to-child transmission, and other Robson classifications, including breech presentation. Unwarranted CS were linked to financial incentives and CSMR, requiring a financial strategy response regulated by policymakers.

In comparison to nonprofit hospitals, private or for-profit institutions are more inclined to embrace CSMR. The role of incentives in the financial plan was identified as a significant element contributing to the rising incidence of cesarean sections. Consequently, a stipulation on incentive arrangements should be introduced.

Mitigating the rising incidence of CS should be seen as a significant objective, as evidenced by 13 studies examining a holistic financial and non-financial strategy to regulate and reduce CS occurrences. The prevailing issue regarding financial expenditures is that CS are more costly than vaginal deliveries. Offering equivalent compensation for CS and vaginal deliveries would effectively reduce cesarean rates and align with suggested strategies for diminishing the frequency of healthcare interventions, such as point-of-care service delivery, to enhance healthcare demand and utilization. An

illustration of its implementation would be offering financial incentives to hospitals with the lowest CS rates. The existing balance between substantial healthcare expenditures and policymakers' objective of ensuring access to medical care is deeply troubling. A cost-effective criterion should be employed to assess the utilization of specific medical care and ascertain its coverage under national health insurance, as implemented in the United Kingdom (Hamilton et al., 2018).

Secondly, this prospective observational study was able to gather complete follow-up data on all 96 women after inclusion and exclusion. This mitigated the potential of information bias resulting from loss to follow-up, hence enhancing the validity of the study outcomes as dictated by the design. The variability in measurement procedures is a significant obstacle to the effectiveness of LUS ultrasonography in predicting obstetric outcomes following CS. Certain studies carefully evaluated various procedures and demonstrated that two-dimensional transvaginal ultrasonography exhibits the highest reproducibility (Adu-Takyi et al., 2024). The sonographic assessment of the LUS has great reproducibility, evidenced by substantial intra-class correlation. This discovery corroborates earlier longitudinal studies evaluating myometrial thickness at the CS scar during pregnancy. A particular research demonstrated comparable reproducibility. Consequently, employing transabdominal ultrasound as a reliable and reproducible instrument for evaluating the myometrium during pregnancy is justified.

The residual myometrial thickness decreased from the first to the third trimester (Naji et al., 2013). This research validates the linear pattern of myometrial thinning correlated with advancing gestational age. This discovery is significant in the discourse on an ideal cut-off value for myometrial thickness deemed safe for VBAC. Furthermore, the interquartile range of myometrial thickness decreased with advancing gestational age. Consequently, based on the findings, we propose evaluating the LUS for the probability of a successful VBAC during the first trimester. Incorporating this information promptly into the antenatal care of women with a history of CS provides ample opportunity for counselling and delivery planning, aligning with the inverted pyramid of prenatal care. Women with a history of CS received particular attention in the recently released German-Austrian-Swiss recommendations for first trimester screening. Integrating our findings while concurrently assessing LUS thickness during first trimester screening may augment the therapeutic applicability of this guideline by forecasting VBAC success.

Studies Limitation

There are some limitations to this analysis, notably regarding the selection of studies; more specifically, the researchers did not investigate studies that were already published in gray literature. Consequently, unpublished reports may have been disregarded. The systematic review encompassed only publications published in English until December 2021, and research in other languages or more recent studies may provide additional insights.

While the second study may be limited by using univariate logistic regression without patient demographic adjustments. The objective of our study was to examine the efficacy of sonographic measurements regardless of demographic factors. Consequently, univariate analysis was considered suitable. Multivariate analysis is crucial for developing predictive models, which is a necessary subsequent step to apply our study findings in a manner akin to prior research (Bujold et al., 2009). Nonetheless, predictive models do not exhibit consistent performance across diverse populations. Consequently, we do not presume that a predictive model derived from our data would be suitable for widespread application (Adu-Takyi et al., 2024).

Implication of the Studies

Based on the findings of this study, it is recommended that a specific policy be developed for public health issues. The policy should place an emphasis on financial management and regular screening audit cycles for CS. Establishing compensation rates between private and public hospitals is essential to reduce requests for caesarean deliveries. Longitudinal studies are essential to evaluate the enduring effects of financial initiatives on CS rates and mother and new-born health. Finally, it is essential to incorporate studies from a wider array of countries, particularly low- and middle-income nations, to improve the generalizability of the results. Moreover, integrating our findings while concurrently assessing LUS thickness during first trimester screening may augment the therapeutic applicability of this guideline by forecasting VBAC success.

Conclusion

Taking into consideration the specific medical and societal risk factors, the findings of this study indicate that it is necessary to address the growing number of cesarean sections that are being performed all over the world. This paper advocates for evidence-based conclusions to tackle each component, with a special emphasis on prospective financial management strategies applicable to the health care system. These findings offer recommendations for additional research to formulate a comprehensive public health policy focused on a financial strategy to decrease the occurrence of cesarean sections. Pregnant women with a history of CS should be reassured that pursuing VBAC is safe. The likelihood of a successful VBAC is high, and sonographic evaluation of the lower uterine region throughout gestation may aid in forecasting success, particularly with increasing myometrial thickness. Moreover, ultrasound findings of bulging are indicative in identifying women with dehiscent CS scars, who may be at elevated risk of uterine rupture.

Summary

Summary of Cumulative Dissertation

Background: The global incidence of cesarean section deliveries is rising and is anticipated to persist in its upward trend. The prevalence of cesarean section has risen from approximately 7% in 1990 to 21.1% in recent years, according to the National Institutes of Health. The World Health Organization recommend a cesarean section rate between 10% and 15%. Moreover, women with a history of cesarean section could have several long-term complications, such as bleeding disorders, pelvic pain, subfertility, and placenta accreta spectrum in a subsequent pregnancy. Pregnant women aiming to proceed with vaginal birth after cesarean section are faced with another major concern of uterine rupture and dehiscence, and this concern leads to increasing numbers of repeat cesarean section in Germany (30%).

Research Question: The aim of these studies was to examine the influence of various financial strategies on the cost management of cesarean deliveries within health coverage schemes. Moreover, we aimed to access the characteristic of sonographic lower uterine

segment after cesarean section and to analyze the association of the sonographic measures with successful vaginal birth after cesarean section. Two important aspects of increasing cesarean section rates discussed. Firstly, the strategy for managing the cost overruns associated with health procedures. And the following question is the characteristic of the post-cesarean lower uterine segment and its changes during a subsequent pregnancy. Which is further explored as a possible predictor of successful vaginal birth after cesarean section.

Methods: The methods of these studies employed a meta-synthesis model for qualitative analysis to integrate data, utilizing a meta-aggregative strategy to organize results derived from various research methodologies. Five critical phases are involved in executing a systematic review: formulating the research question; identifying relevant literature and systematically selecting articles; evaluating article quality; extracting data; and synthesizing data through compilation, summarization, and reporting of results. This meta-synthesis review encompasses all scientific literature published from January 2017 to December 2021, sourced from the PubMed, ProQuest, and ScienceDirect databases.
The second study method assessed pre-and intra-gestational lower uterine segment following cesarean section in a prior pregnancy through a prospective observational cohort investigation. Qualified and consenting women participated in the initial transvaginal sonographic assessment 9-18 months following surgery to evaluate the residual myometrial thickness and confirm the existence of a niche. The residual myometrial thickness ratio was determined as a percentage of residual myometrial thickness relative to the thickness of the complete anterior uterine wall.

Results: This review comprised 26 publications published from 2017 to 2021 to guarantee the recency of the findings. The database search yielded 883 prospective articles: ProQuest (n = 507), PubMed (n = 168), and ScienceDirect (n = 168). The titles, abstracts, and whole texts were evaluated to ascertain the study's eligibility. The research encompassed sample sizes varying from 96 to 47,661 people, including women, newborns, mother-child dyads, and stakeholders. Numerous publications addressed the payment systems in low-middle and upper-middle-income nations. All studies incorporated in the data extraction were categorized into three principal thematic findings: demographic factors influencing cesarean sections; the necessity versus

superfluity of increasing cesarean sections rates; and effective financial strategies to manage the cost overruns associated with specific health procedures.
The second study involved a total of 96 women who entered and successfully completed a new pregnancy to be included in the analysis. No statistically significant difference was observed in the median lower uterine thickness between women with bulging (8.2, 5, and 2.7 mm) and those without bulging (9.4, 5.6, and 3.1 mm) throughout the first, second, and third trimesters, with p-values of 0.75, 0.63, and 0.7, respectively. Univariate logistic regression revealed a statistically significant relationship between lower uterine segment thickness in the first trimester and the likelihood of successful vaginal birth after cesarean section once attempted. An increase of one millimeter in thickness during the first trimester elevated the likelihood of vaginal birth after cesarean section by 50-120%, contingent upon the measurement employed.

Discussion: This study revealed data endorsing the application of Robson categorization in clinical audit cycles to reduce the incidence of cesarean sections. The alternative strategies for decreasing the rate mostly focused on the application of financial measures at both national and local levels within the hospital setting. The rising global prevalence of cesarean sections is widely recognized; yet socioeconomic discrepancies in low- to middle-income nations have resulted in their over utilization in many regions. Secondly, this prospective observational study was able to gather complete follow-up data on all 96 women after inclusion and exclusion. This mitigated the potential of information bias resulting from loss to follow-up, hence enhancing the validity of the study outcomes as dictated by the design. The variability in measurement procedures is a significant obstacle to the effectiveness of lower uterine segment ultrasonography in predicting obstetric outcomes following cesarean sections.

Conclusion: Taking into consideration the specific medical and societal risk factors, the findings of this study indicate that it is necessary to address the growing number of cesarean sections that are being performed all over the world. This paper advocates for evidence-based conclusions to tackle each component, with a special emphasis on prospective financial management strategies applicable to the health care system. These findings offer recommendations for additional research to formulate a comprehensive public health policy focused on a financial strategy to decrease the occurrence of cesarean sections. Pregnant women with a history of cesarean sections should be reassured that

pursuing vaginal birth after cesarean section is safe. The likelihood of a successful vaginal birth after cesarean section is high, and sonographic evaluation of the lower uterine region throughout gestation may aid in forecasting success, particularly with increasing myometrial thickness. Moreover, ultrasound findings of bulging are indicative in identifying women with dehiscent cesarean sections scars, who may be at elevated risk of uterine rupture.

Zusammenfassung der cumulative Dissertation

Hintergrund: Die weltweite Inzidenz von Kaiserschnittgeburten steigt und wird voraussichtlich weiter steigen. Die Prävalenz von Kaiserschnitten ist nach Angaben der National Institutes of Health von etwa 7 % im Jahr 1990 auf 21,1 % in den letzten Jahren gestiegen. Die Weltgesundheitsorganisation empfiehlt eine Kaiserschnittrate zwischen 10 % und 15 %. Darüber hinaus können Frauen mit einem Kaiserschnitt in der Vorgeschichte mehrere Langzeitkomplikationen haben, wie z. B. Blutungsstörungen, Beckenschmerzen, Subfertilität und Plazenta-Akkreta-Spektrum in einer nachfolgenden Schwangerschaft. Schwangere, die nach einem Kaiserschnitt vaginal gebären, sind mit einem weiteren großen Problem der Gebärmutterruptur und -dehiszenz konfrontiert, und diese Sorge führt in Deutschland zu einer zunehmenden Zahl von wiederholten Kaiserschnitten (30 %).

Fragestellung: Ziel dieser Studien war es, den Einfluss verschiedener Finanzierungsstrategien auf das Kostenmanagement von Kaiserschnittgeburten im Rahmen von Versorgungssystemen zu untersuchen. Darüber hinaus war es unser Ziel, die Charakteristik des sonographischen unteren Uterussegments nach Kaiserschnitt zu erschließen und den Zusammenhang der sonographischen Messungen mit einer erfolgreichen vaginalen Geburt nach Kaiserschnitt zu analysieren. Zwei wichtige Aspekte der Erhöhung der Kaiserschnittraten wurden besprochen. Erstens, die Strategie für den Umgang mit den Kostenüberschreitungen, die mit Gesundheitsverfahren verbunden sind. Und die folgende Frage ist die Charakteristik des unteren Uterussegments nach dem Kaiserschnitt und seiner Veränderungen während einer nachfolgenden Schwangerschaft. Dies wird als möglicher Prädiktor für eine erfolgreiche vaginale Geburt nach Kaiserschnitt weiter untersucht.

Methoden: Die Methoden dieser Studien verwendeten ein Metasynthesemodell für die qualitative Analyse, um Daten zu integrieren, wobei eine metaaggregierte Strategie verwendet wurde, um Ergebnisse aus verschiedenen Forschungsmethoden zu organisieren. Die Durchführung einer systematischen Überprüfung umfasst fünf kritische Phasen: Formulierung der Forschungsfrage; Identifizierung relevanter Literatur und systematische Auswahl von Artikeln; Bewertung der Artikelqualität; Extrahieren von Daten; und Synthese von Daten durch Zusammenstellung, Zusammenfassung und

Berichterstattung von Ergebnissen. Diese Metasynthese umfasst die gesamte wissenschaftliche Literatur, die zwischen Januar 2017 und Dezember 2021 veröffentlicht wurde und aus den Datenbanken PubMed, ProQuest und ScienceDirect stammt.
Die zweite Studienmethode untersuchte das untere Uterussegment vor und während der Schwangerschaft nach einem Kaiserschnitt in einer früheren Schwangerschaft durch eine prospektive Beobachtungskohortenuntersuchung. Qualifizierte und einwilligende Frauen nahmen 9-18 Monate nach der Operation an der ersten transvaginalen sonographischen Untersuchung teil, um die verbleibende Myomerationsdicke zu beurteilen und das Vorhandensein einer Nische zu bestätigen. Das Verhältnis der Restmyometriedicke wurde als Prozentsatz der Restmyometriedicke im Verhältnis zur Dicke der gesamten vorderen Uteruswand bestimmt.

Ergebnisse: Dieser Review umfasste 26 Publikationen, die zwischen 2017 und 2021 veröffentlicht wurden, um die Aktualität der Ergebnisse zu gewährleisten. Die Datenbankrecherche ergab 883 prospektive Artikel: ProQuest (n = 507), PubMed (n = 168) und ScienceDirect (n = 168). Die Titel, Abstracts und ganzen Texte wurden ausgewertet, um die Eignung der Studie zu ermitteln. Die Studie umfasste Stichprobengrößen von 96 bis 47.661 Personen, darunter Frauen, Neugeborene, Mutter-Kind-Dyaden und Interessengruppen. Zahlreiche Publikationen befassten sich mit den Zahlungssystemen in Ländern mit niedrigem mittlerem und mittlerem Einkommen. Alle Studien, die in die Datenextraktion einflossen, wurden in drei thematische Hauptergebnisse eingeteilt: demografische Faktoren, die Kaiserschnitte beeinflussen; die Notwendigkeit versus Überflüssigkeit einer Erhöhung der Kaiserschnittraten; und effektive Finanzstrategien zur Bewältigung der Kostenüberschreitungen, die mit bestimmten Gesundheitsverfahren verbunden sind.
An der zweiten Studie nahmen insgesamt 96 Frauen teil, die eine neue Schwangerschaft begonnen und erfolgreich abgeschlossen hatten, um in die Analyse einbezogen zu werden. Es wurde kein statistisch signifikanter Unterschied in der medianen unteren Uterusdicke zwischen Frauen mit Vorwölbung (8,2, 5 und 2,7 mm) und Frauen ohne Vorwölbung (9,4, 5,6 und 3,1 mm) während des ersten, zweiten und dritten Trimesters mit p-Werten von 0,75, 0,63 bzw. 0,7 beobachtet. Die univariate logistische Regression zeigte einen statistisch signifikanten Zusammenhang zwischen der geringeren Dicke des Uterussegments im ersten Trimester und der Wahrscheinlichkeit einer erfolgreichen vaginalen Geburt nach einem Kaiserschnitt nach dem Versuch eines Kaiserschnitts . Eine

Zunahme der Dicke um einen Millimeter während des ersten Trimesters erhöhte die Wahrscheinlichkeit einer vaginalen Geburt nach einem Kaiserschnitt um 50-120%, abhängig von der verwendeten Messung.

Diskussion: Diese Studie ergab Daten, die die Anwendung der Robson-Kategorisierung in klinischen Auditzyklen unterstützen, um die Inzidenz von Kaiserschnitten zu reduzieren. Die alternativen Strategien zur Senkung des Satzes konzentrierten sich meist auf die Anwendung finanzieller Maßnahmen sowohl auf nationaler als auch auf lokaler Ebene im Krankenhausumfeld. Die weltweit steigende Prävalenz von Kaiserschnitten ist weithin anerkannt; Dennoch haben sozioökonomische Unterschiede in Ländern mit niedrigem bis mittlerem Einkommen dazu geführt, dass sie in vielen Regionen übermäßig genutzt werden. Zweitens war diese prospektive Beobachtungsstudie in der Lage, vollständige Follow-up-Daten zu allen 96 Frauen nach Ein- und Ausschluss zu sammeln. Dies minderte das Potenzial von Informationsverzerrungen, die sich aus dem Verlust der Nachbeobachtung ergaben, und erhöhte somit die Validität der Studienergebnisse, wie sie vom Design vorgegeben wurde. Die Variabilität der Messverfahren ist ein erhebliches Hindernis für die Wirksamkeit der Ultraschalluntersuchung des unteren Uterussegments bei der Vorhersage geburtshilflicher Ergebnisse nach Kaiserschnitten.

Schlussfolgerung: Unter Berücksichtigung der spezifischen medizinischen und gesellschaftlichen Risikofaktoren deuten die Ergebnisse dieser Studie darauf hin, dass es notwendig ist, der wachsenden Zahl von Kaiserschnitten, die weltweit durchgeführt werden, Rechnung zu tragen. Dieses Papier plädiert für evidenzbasierte Schlussfolgerungen, um jede Komponente anzugehen, mit besonderem Schwerpunkt auf prospektiven Finanzmanagementstrategien, die auf das Gesundheitssystem anwendbar sind. Diese Ergebnisse bieten Empfehlungen für zusätzliche Forschung, um eine umfassende Gesundheitspolitik zu formulieren, die sich auf eine Finanzstrategie konzentriert, um das Auftreten von Kaiserschnitten zu verringern. Frauenmit Kaiserschnitten in der Vorgeschichte sollten beruhigt sein, dass eine vaginale Geburt nach einem Kaiserschnitt sicher ist. Die Wahrscheinlichkeit einer erfolgreichen vaginalen Geburt nach einem Kaiserschnitt ist hoch, und die sonographische Beurteilung der unteren Gebärmutterregion während der Schwangerschaft kann bei der Vorhersage des Erfolgs helfen, insbesondere bei zunehmender Myomerationsdicke. Darüber hinaus sind

Ultraschallbefunde einer Ausbeulung ein Hinweis auf die Identifizierung von Frauen mit Narben eines Kaiserschnitts, die ein erhöhtes Risiko für einen Uterusriss haben können.

Bibliography

1. Adu-Takyi, C., Munazzah, R., Owusu, Y. G., Owusu-Bempah, A., Arhin, B., Opare-Addo, H. S., Peprah, A., Collins, S. L., & Adu-Bredu, T. (2024). Accuracy of sonographic lower segment thickness and prediction of vaginal birth after caesarean in a resourced-limited setting; Prospective study. *BJOG: An International Journal of Obstetrics and Gynaecology*, *131*(13), 1771–1779. https://doi.org/10.1111/1471-0528.17872
2. Andalas, M., Maharani, C. R., Jannah, R., Harisah, S., & Haekal, M. (2020). Profile of Cesarean Sections since the BPJS Era. *Indonesian Journal of Obstetrics and Gynecology*, 5–9.
3. Arunda, M. O., Agardh, A., & Benedict Oppong Asamoah. (2020). Cesarean delivery and associated socioeconomic factors and neonatal survival outcome in Kenya and Tanzania: Analysis of national survey data. *Global Health Action*, *13*(1). Research Library. https://doi.org/10.1080/16549716.2020.1748403
4. Betran, A. P., Ye, J., Moller, A.-B., Souza, J. P., & Zhang, J. (2021). Trends and projections of caesarean section rates: Global and regional estimates. *BMJ Global Health*, *6*(6), e005671.
5. Boatin, A. A., Cullinane, F., Torloni, M. R., & Betrán, A. P. (2018). Audit and feedback using the Robson classification to reduce caesarean section rates: A systematic review. *BJOG: An International Journal of Obstetrics and Gynaecology*, *125*(1), 36–42. https://doi.org/10.1111/1471-0528.14774
6. Bujold, E., Jastrow, N., Simoneau, J., Brunet, S., & Gauthier, R. J. (2009). Prediction of complete uterine rupture by sonographic evaluation of the lower uterine segment. *American Journal of Obstetrics and Gynecology*, *201*(3), 320.e1-6. https://doi.org/10.1016/j.ajog.2009.06.014
7. Chen, I., Opiyo, N., Tavender, E., Mortazhejri, S., Rader, T., Petkovic, J., Yogasingam, S., Taljaard, M., Agarwal, S., Laopaiboon, M., Wasiak, J., Khunpradit, S., Lumbiganon, P., Gruen, R. L., & Betran, A. P. (2018). Non-clinical interventions for reducing unnecessary caesarean section. *The Cochrane Database of Systematic Reviews*, *9*, CD005528. https://doi.org/10.1002/14651858.CD005528.pub3
8. Dodd, J. M., Crowther, C. A., Grivell, R. M., & Deussen, A. R. (2017). Elective repeat caesarean section versus induction of labour for women with a previous caesarean birth. *The Cochrane Database of Systematic Reviews*, *7*, CD004906. https://doi.org/10.1002/14651858.CD004906.pub5
9. Feldhaus, I., & Mathauer, I. (2018). Effects of mixed provider payment systems and aligned cost sharing practices on expenditure growth management, efficiency, and equity: A structured review of the literature. *BMC Health Services Research*, *18*(1), 996. https://doi.org/10.1186/s12913-018-3779-1
10. Finnsdottir, S. K., Maghsoudlou, P., Pepin, K., Gu, X., Carusi, D. A., Einarsson, J. I., & Rassier, S. L. C. (2023). Uterine rupture and factors associated with adverse outcomes. *Archives of Gynecology and Obstetrics*, *308*(4), 1271–1278. https://doi.org/10.1007/s00404-022-06820-w
11. Fujihara, N., Lark, M. E., Fujihara, Y., & Chung, K. C. (2017). The effect of economic downturn on the volume of surgical procedures: A systematic review. *International Journal of Surgery (London, England)*, *44*, 56–63. https://doi.org/10.1016/j.ijsu.2017.06.036

12. Hamilton, B. H., Jungheim, E., McManus, B., & Pantano, J. (2018). Health Care Access, Costs, and Treatment Dynamics: Evidence from In Vitro Fertilization. *The American Economic Review*, *108*(12), 3725–3777. Research Library. https://doi.org/10.1257/aer.20161014
13. Hoxha, I., Syrogiannouli, L., Braha, M., Goodman, D. C., da Costa, B. R., & Jüni, P. (2017). Caesarean sections and private insurance: Systematic review and meta-analysis. *BMJ Open*, *7*(8), e016600. https://doi.org/10.1136/bmjopen-2017-016600
14. Hoxha, I., Syrogiannouli, L., Luta, X., Tal, K., Goodman, D. C., da Costa, B. R., & Jüni, P. (2017). Caesarean sections and for-profit status of hospitals: Systematic review and meta-analysis. *BMJ Open*, *7*(2), e013670. https://doi.org/10.1136/bmjopen-2016-013670
15. Kalliala, I., Markozannes, G., Gunter, M. J., Paraskevaidis, E., Gabra, H., Mitra, A., Terzidou, V., Bennett, P., Martin-Hirsch, P., Tsilidis, K. K., & Kyrgiou, M. (2017). Obesity and gynaecological and obstetric conditions: Umbrella review of the literature. *BMJ (Clinical Research Ed.)*, *359*, j4511. https://doi.org/10.1136/bmj.j4511
16. Kehl, S., Düster, H., Weiss, C., Bader, S., Schneider, M., Beckmann, M. W., Dammer, U., & Pretscher, J. (2025). Trial of labor after caesarean section in low risk pregnancies: Is it risky? *Archives of Gynecology and Obstetrics*, *311*(4), 965–971. https://doi.org/10.1007/s00404-024-07700-1
17. Kennedy, C. E., Yeh, P. T., Pandey, S., Betran, A. P., & Narasimhan, M. (2017). Elective cesarean section for women living with HIV: A systematic review of risks and benefits. *AIDS (London, England)*, *31*(11), 1579–1591. https://doi.org/10.1097/QAD.0000000000001535
18. Kingdon, C., Downe, S., & Betran, A. P. (2018a). Non-clinical interventions to reduce unnecessary caesarean section targeted at organisations, facilities and systems: Systematic review of qualitative studies. *PloS One*, *13*(9), e0203274. https://doi.org/10.1371/journal.pone.0203274
19. Kingdon, C., Downe, S., & Betran, A. P. (2018b). Women's and communities' views of targeted educational interventions to reduce unnecessary caesarean section: A qualitative evidence synthesis. *Reproductive Health*, *15*(1), 130. https://doi.org/10.1186/s12978-018-0570-z
20. Liang, J., Mu, Y., Li, X., Tang, W., Wang, Y., Liu, Z., Huang, X., Scherpbier, R. W., Guo, S., Li, M., Dai, L., Deng, K., Deng, C., Li, Q., Kang, L., Zhu, J., & Ronsmans, C. (2018). Relaxation of the one child policy and trends in caesarean section rates and birth outcomes in China between 2012 and 2016: Observational study of nearly seven million health facility births. *BMJ : British Medical Journal (Online)*, *360*. Research Library. https://doi.org/10.1136/bmj.k817
21. Lodge-Tulloch, N. A., Elias, F. T. S., Pudwell, J., Gaudet, L., Walker, M., Smith, G. N., & Velez, M. P. (2021). Caesarean section in pregnancies conceived by assisted reproductive technology: A systematic review and meta-analysis. *BMC Pregnancy and Childbirth*, *21*(1), 244. https://doi.org/10.1186/s12884-021-03711-x
22. Loke, A. Y., Davies, L., & Mak, Y.-W. (2019). Is it the decision of women to choose a cesarean section as the mode of birth? A review of literature on the views of stakeholders. *BMC Pregnancy and Childbirth*, *19*(1), 286. https://doi.org/10.1186/s12884-019-2440-2
23. Mędrzycka-Dabrowska, W., Czyż-Szypenbejl, K., & Pietrzak, J. (2018). A review of randomized trials comparisons of epidural with parenteral forms of pain relief during

labour and its impact on operative and cesarean delivery rate. *Ginekologia Polska*, *89*(8), 460–467. https://doi.org/10.5603/GP.a2018.0079

24. Melkie, A., Addisu, D., Mekie, M., & Dagnew, E. (2021). Failed induction of labor and its associated factors in Ethiopia: A systematic review and meta-analysis. *Heliyon*, *7*(3), e06415. https://doi.org/10.1016/j.heliyon.2021.e06415
25. Naji, O., Daemen, A., Smith, A., Abdallah, Y., Saso, S., Stalder, C., Sayasneh, A., McIndoe, A., Ghaem-Maghami, S., Timmerman, D., & Bourne, T. (2013). Changes in Cesarean section scar dimensions during pregnancy: A prospective longitudinal study. *Ultrasound in Obstetrics & Gynecology: The Official Journal of the International Society of Ultrasound in Obstetrics and Gynecology*, *41*(5), 556–562. https://doi.org/10.1002/uog.12334
26. Olieman, R. M., Siemonsma, F., Bartens, M. A., Garthus-Niegel, S., Scheele, F., & Honig, A. (2017). The effect of an elective cesarean section on maternal request on peripartum anxiety and depression in women with childbirth fear: A systematic review. *BMC Pregnancy and Childbirth*, *17*(1), 195. https://doi.org/10.1186/s12884-017-1371-z
27. Oyugi, B., Kendall, S., & Peckham, S. (2021). Effects of free maternal policies on quality and cost of care and outcomes: An integrative review. *Primary Health Care Research & Development*, *22*. Research Library. https://doi.org/10.1017/S1463423621000529
28. Özsu, U. (2009). De-territorializing and re-territorializing Lotus: Sovereignty and systematicity as dialectical nation-building in early republican Turkey. *Leiden Journal of International Law*, *22*(1), 29–49.
29. Sandall, J., Tribe, R. M., Avery, L., Mola, G., Visser, G. H., Homer, C. S., Gibbons, D., Kelly, N. M., Kennedy, H. P., Kidanto, H., Taylor, P., & Temmerman, M. (2018). Short-term and long-term effects of caesarean section on the health of women and children. *Lancet (London, England)*, *392*(10155), 1349–1357. https://doi.org/10.1016/S0140-6736(18)31930-5
30. Shirzad, M., Shakibazadeh, E., Hajimiri, K., Betran, A. P., Jahanfar, S., Bohren, M. A., Opiyo, N., Long, Q., Kingdon, C., Colomar, M., & Abedini, M. (2021). Prevalence of and reasons for women's, family members', and health professionals' preferences for cesarean section in Iran: A mixed-methods systematic review. *Reproductive Health*, *18*(1), 3. https://doi.org/10.1186/s12978-020-01047-x
31. Sungkar, A., Santoso, B. I., Surya, R., & Fattah, A. N. (2019). Classifying cesarean section using Robson Classification: An Indonesian tertiary hospital survey. *Majalah Obstetri & Ginekologi*, *27*(2), 66–70.
32. Teplitskaya, L., Ross, R., & Dutta, A. (2018). Has Indonesia's National Health Insurance Scheme Improved Family Planning use? *Washington DC*.
33. Wang, C.-B., Chiu, W.-W.-C., Lee, C.-Y., Sun, Y.-L., Lin, Y.-H., & Tseng, C.-J. (2009). Cesarean scar defect: Correlation between Cesarean section number, defect size, clinical symptoms and uterine position. *Ultrasound in Obstetrics & Gynecology: The Official Journal of the International Society of Ultrasound in Obstetrics and Gynecology*, *34*(1), 85–89. https://doi.org/10.1002/uog.6405
34. Wattar, B. H. A., PhD, Honess, E., MBCHB, Bunnewell, S., MBCHB, Welton, N. J., PhD, Quenby, S., PhD, Khan, K. S., MSc, Zamora, J., PhD, & Thangaratinam, S., PhD. (2021). Effectiveness of intrapartum fetal surveillance to improve maternal and neonatal outcomes: A systematic review and network meta-analysis: CMAJ. *Canadian Medical*

Association. Journal, *193*(14), E468–E477. Research Library. https://doi.org/10.1503/cmaj.202538

35. Yang, M., Qin, Q., Fang, Q., Jiang, L., & Nie, S. (2017). Cesarean section to prevent mother-to-child transmission of hepatitis B virus in China: A meta-analysis. *BMC Pregnancy and Childbirth*, *17*(1), 303. https://doi.org/10.1186/s12884-017-1487-1

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