


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

## A protocol for systematic review

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### Abstract

**Background:** The incidence of cesarean section (c-section) has been increasing after the introduction of national health coverage. There is potential evidence that unnecessary c-sections can be reduced through an effective financial strategy, which would make it possible to increase health equity in the future. Consistent with global trends, the rate of c-section in Indonesia increased from 1.6% in 1991 to 17.6% in 2017, while the World Health Organization standard rate is 10% to 15%. This study aims to explore and analyze strategies to reduce c-section rates and to report evidence-based research on an effective financial strategy model for reducing these rates.

**Methods:** We used a systematic review framework involving electronic databases including PubMed, ProQuest, and ScienceDirect. The following literature search terms were used: “cost-benefit analysis,” “universal health care,” “cost controls,” “health expenditures,” “out-of-pocket expenses,” “c-section,” and “abdominal delivery.” The Joanna Briggs Institute critical appraisal checklist was used to independently assess the methodological quality. The findings were compiled using a meta-aggregation approach to summarize quantitative analysis results potentially based on different methodologies.

**Results:** Among 883 database records, 26 studies were retained for full-text review. C-section risk factors, the role of financial system evaluation, and the application of the clinical audit cycles with assessments using Robson classification were discussed in the included papers. Several studies highlighted the crucial function of evaluating reward reimbursement schemes, suggesting that decreased c-section rates and other maternal-neonatal outcomes should be used as indicators.

**Discussion:** This study identified an evidence base that suggests using Robson classification in clinical audit cycles to reduce c-section rates and avoid unnecessary c-sections. The other proposals for decreasing the rate were mainly focused on financial and nonfinancial strategies applied nationally and locally in hospital settings.

**Abbreviations:** C-section = cesarean section, CSMR = c-section per maternal request, ECS = elective cesarean section, IV = intravenous, JBI = Joanna Briggs Institute, JKN = *Jaminan Kesehatan Negara*, MTCT = mother to children transmission, OR = odds ratio.

**Keywords:** effective financial strategy, health equity, national health coverage, Robson classification, unnecessary c-section

## 1. Introduction

*Badan Penyelenggara Jaminan Sosial* (English: Healthcare and Social Security Agency) was established as an institution to deliver the National Health Insurance program in Indonesia (*Jaminan Kesehatan Negara* [JKN]) following the introduction of national laws on the national social security system (Law numbers: 24 [2011] and 40 [2004]).<sup>[1]</sup> The JKN program covers

maternal healthcare costs for services, including antenatal care, delivery, postpartum bleeding care, contraception, postnatal care, vaginal delivery, and neonatal health services.<sup>[1,2]</sup> In addition, the program covers maternal and neonatal complications, cesarean delivery, reproductive system infections, ante- and postpartum care, and neonatal health at the referral service level.<sup>[1,2]</sup>

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All data generated or analyzed during this study are included in this published article [and its supplementary information files].

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Globally, the incidence of cesarean section (c-section) delivery is increasing and is predicted to continue to increase in the future.<sup>[3]</sup> In China, for instance, most women deliver a baby at the hospital via c-section, although this mode of birth is not indicated medically.<sup>[4]</sup> Notably, the c-section rate in China increased from 29% to 35% between 2008 and 2014.<sup>[4]</sup>

However, according to the World Health Organization, the recommended rate of c-sections is between 10% and 15%.<sup>[5]</sup> Specifically, in Indonesia, the incidence of c-sections has increased after the implementation of JKN.<sup>[1]</sup> For instance, c-section incidence in government hospitals increased from 13.29% to 54.35% since the implementation of JKN between January 1, 2014, and December 31, 2016, compared to the incidence between 2011 and 2013 (41.07%).<sup>[1]</sup> The increasing c-section rates lead to universal coverage boundaries, importantly in relation to funding more essential healthcare services.<sup>[6]</sup> This effect is exacerbated when the weight of the financial cost of a c-section on the hospital financing system is included. Typically, hospital claims for c-sections are less than the Indonesia Case-Based Group pays.<sup>[6]</sup>

Based on these findings, we considered that exploring how to implement an effective strategy for c-section cost management in health financing systems by reviewing potentially relevant studies in the literature is warranted. Thus, the objective of this systematic review was to explore how different financial strategies impact the cost management of cesarean deliveries within health coverage schemes, with the goal of identifying strategies that could help regulate cost overruns associated with this specific medical procedure.

## 2. Methods

Ethical permission for the entire project was granted by the Ethical Committee of Universitas Aisyiyah Yogyakarta (reference number: 1934/KEP-UNISA/I/2022). The Joanna Briggs Institute's (JBI) Critical Appraisal Checklist was used to independently evaluate methodological quality. This systematic review protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO, URL: <https://www.crd.york.ac.uk/prospero/>, registration number: CRD42022302901).

The systematic review method is an academic approach suitable for use with international reporting criteria standards and is applied to incorporate research-based evidence, ranging from summaries, explanations, and interpretations, in addressing research questions through performing qualitative and quantitative analyses.<sup>[7,8]</sup> Regardless of research designs, it requires the identification of relevant studies, which allows researchers to define related search terms and conduct a more precise search.<sup>[9]</sup> As the qualitative analysis, a meta-synthesis model was implemented to synthesize findings, using the meta-aggregative approach to manage findings based on different research methodologies.

### 2.1. Search strategy

There are 5 important steps involved in conducting a systematic review: research question synthesis; relevant literature identification and systematic article selection; article quality evaluation; data extraction; and data synthesis via compilation, summarizing, and reporting results.<sup>[9]</sup>

All scientific literature published between January 2017 and December 2021 retrieved from the PubMed, ProQuest, and ScienceDirect databases was considered for this meta-synthesis review. The selection of these 3 databases was predicated on their status as premier resources and journal platforms, which are recognized as comprehensive databases for health sciences. PubMed uses machine learning to select the most pertinent citations that are presented at the top of the results. On the other

hand, we decided to not include other databases, such as Google Scholar (GS), in this study. We found that it is not known what algorithm GS uses to produce its search results; therefore, the results could be skewed. Moreover, non-scholarly content cannot be filtered on GS.

The eligibility criteria for inclusion were as follows: qualitative research; articles written in English; full text available online; and elaborate explanations of the design, delivery, and strategy of an effective health financial model.

Qualitative designs are an essential approach in healthcare analysis, as they enable researchers to comprehend the context of a phenomenon and produce comprehensive data. Moreover, they enable the inclusion of patients' viewpoints and experiences into the design and execution of studies in contrast to quantitative designs.

The reason for excluding gray literature from this study is the lack of peer evaluation of unpublished works. Assessments identified in gray literature and material may be significantly susceptible to bias for several reasons, such as errors and insufficient data. Furthermore, gray literature may have inaccuracies due to the absence of a rigorous editorial procedure.

**2.1.1. Research question development.** Constructing a well-structured research question can potentially contribute to conducting an effective and practical review by selecting literature that reflects the scope of the study.<sup>[8]</sup> In this review, 3 research questions were developed:

1. How do medical service costs, especially the cost of c-section, increase in health coverage schemes?
2. How is a healthcare system managed in terms of selecting criteria for a health service to be eligible for health coverage?
3. What might be an effective financial strategy for regulating the cost overrun of specific health procedures?

Specifically, the framework used to develop the research questions was as follows:

- P (patient, population, problem): medical service cost and health care system.
- I (intervention, exposure): health financing management.
- C (comparison, alternative intervention): financial strategy.
- O (outcome of interest): reduction of unnecessary health spending.

**2.1.2. Identifying relevant studies.** The derivation of research questions is essential to define possible keywords for searching databases to find relevant academic literature, such as reports, evidence-based research, and articles, published in scholarly journals. Relevant keywords adopted from the Medical Subject Headings (MeSH) were used in this study: "cost-benefit analysis," "universal health care," "cost controls," "health expenditures," "out-of-pocket expenses," "c-section," and "abdominal delivery." These keywords were combined into search strings using the Boolean operators "OR" and "AND." One of the search strings used on PubMed was as follows: ((((((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 same keywords were used on the ProQuest and ScienceDirect databases.

### 2.2. Study selection and data extraction

The articles collected from the 3 databases were exported into Zotero software (version 5.0.96; Corporation for Digital Scholarship [Vienna, VA] and the Roy Rosenzweig Center for History and New Media [Fairfax, VA]), and duplicates were deleted. Two investigators (D.S. and A.a.N.) independently screened titles and abstracts to identify all eligible studies

based on the inclusion criteria. The eligible studies were then critically appraised by D.S. and A.a.N. using the JBI checklist and were included in this review after an independent cross-check by 2 reviewers (D.B. and F.B.). Disagreements between reviewers arising from different points of view or ideas were resolved through serial discussion. Eleven questions were used for the critical appraisal to guide inclusion in the systematic review on accessing each of the studies to assess the following: review questions, appropriateness of inclusion criteria, search strategy used, database resources used to obtain a sufficient number of articles, appraisal criteria and process, methodology, publication bias, policy recommendations, and further research recommendations.<sup>[10]</sup>

Data extraction was performed to capture the following information from each article: study objectives; study design; study settings, country, year, and type of institution; c-section criteria used; and source of data and completeness. Evidence was synthesized using the meta-aggregative approach. Data synthesis involves categorization, which entails a thorough and repetitive analysis of the collected information. Grouping categories of findings are based on their semantic similarity and are further used to define themes. Each finding was rated as an unexplicit, unsuitable, or unsupported statement to obtain a credibility level. The explicitness included all financing strategies not related to c-section deliveries. Unmatched findings were excluded in the subsequent analysis. Synthesized findings were obtained from grouping categories created in the final data analysis step. Coding and synthesis of the assembled findings were performed repeatedly by all reviewers (D.S., A.a.N., D.B., and F.B.), followed by several discussions to resolve disagreements.

### 3. Results

This review included 26 articles published between 2017 and 2021 to ensure that the results were recent. The database search identified 883 potential articles: ProQuest (n = 507), PubMed (n = 168), and ScienceDirect (n = 168). The titles, abstracts, and full texts were screened to determine the eligibility of the study (Fig. 1). The sample sizes in the studies ranged from 96 to 47,661 participants, and the types of participants included women, neonates, mother-child pairs, and stakeholders. Most articles discussed the payment methods in low-middle and upper-middle-income countries.<sup>[11–30]</sup>

The research evidence was critically appraised to determine the study's methodology and extent to which it addressed possible study bias while conducting and performing analyses. All research findings included in the systematic review were critically appraised by D.S. and A.a.N. using JBI systematic review tools. During study selection, the authors included all important components and research details in the summary findings.

After critical appraisal using the JBI critical appraisal tools, all 26 studies (Fig. 1) provided clarity on the research questions (Table 1), and the inclusion criteria were found to be appropriate for the review questions. Table 1 describes the critical appraisal items for each study. Eleven questions were applied to critically appraise each of the studies.

All studies included in the data extraction process were grouped into 3 main thematic findings: demographic factors influencing c-section<sup>[11–13,15,17–19,22,23,25,26,31–33]</sup>; whether increasing the number of c-sections is necessary or unnecessary<sup>[11–15,17,18,21,23–28,32–34]</sup>; and effective financial strategies to regulate the cost overrun of specific health procedures.<sup>[14,16,18,20–22,27,29–32,35,36]</sup>

#### 3.1. Theme 1: Demographic factors influencing c-section

This segment comprised 47 quotations that presented data on individual maternal conditions that led to the selection of a c-section as the MOD.

**3.1.1. Overweight.** One study quoted that the odds of c-section increase (53%) in relation to the pregnant mothers' overweight status, with obesity increasing the odds by 126%.<sup>[12]</sup> This finding was consistent with that of another study that found adiposity to be strongly correlated with c-sections.<sup>[32]</sup> Women with elevated body mass index (BMI) face a heightened risk of delivery problems compared to those with lower BMI. Moreover, women with elevated BMI exhibited prolonged intervals from choice to delivery and a higher incidence of epidural anesthesia failure compared to their nonobese counterparts.

**3.1.2. Mother to children transmission of diseases.** Mother-to-child transmission (MTCT) is most likely to occur during uterine contractions and placental tearing at birth, resulting in microperfusion of maternal blood into the fetal bloodstream.<sup>[15]</sup> Elective cesarean section (ECS) is recommended clinically as a preventive method against the MTCT of the hepatitis B virus and human immunodeficiency virus.<sup>[15,17]</sup> One study found that ECS significantly reduced maternal morbidity and lowered the rate of human immunodeficiency virus infections in infants (odds ratio [OR] = 0.2, 95% confidence interval: 0.0–0.5).<sup>[17]</sup>

**3.1.3. Failed induction.** Unsuccessful uterine contractions and inadequate cervical changes for at least 1 hour after 6 to 8 hours of oxytocin administration or failed induction are risk factors for increasing c-section rates and are more likely to occur in primiparous women than in multiparous mothers.<sup>[19]</sup> An unfavorable cervix also leads to decisions to perform c-sections, although the procedure is contraindicated for women with uterine scars using both vaginal prostaglandins and intravenous (IV) oxytocin.<sup>[34]</sup>

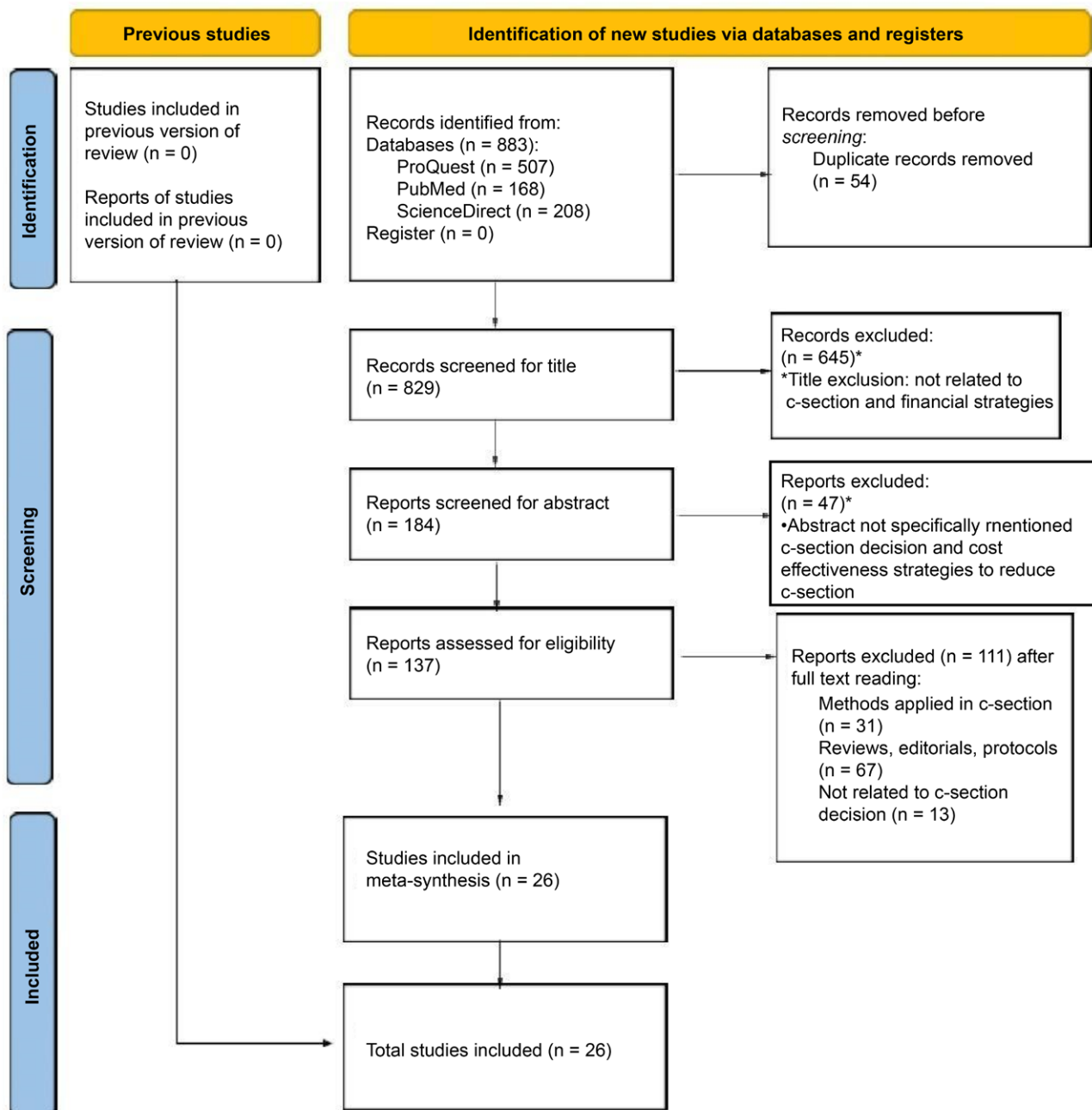
**3.1.4. Other medical concerns.** The decision to perform ECS was also seen in the case of women in breech presentation groups (Robson groups 6 and 7).<sup>[31]</sup> However, 1 study reported that ECS was more likely among singleton pregnant women who conceived via assisted reproductive technology than among those who conceived naturally.<sup>[11]</sup>

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

Many factors underlie the increasing number of c-sections worldwide, including whether the decision was medically necessary or unnecessary. The background to the increasing c-section rate includes reasons ranging from medical conditions, individual or patient preferences, and profit-related reasons.

**3.2.1. Consideration of financial incentives.** The profit-oriented status of healthcare centers, including hospitals, was associated with a 41% increase in the c-section rate.<sup>[12]</sup> Given the mechanism, this association was observed among financial incentives, described as the supply factors influencing a given condition through the amount and type of delivered care.<sup>[12]</sup> Furthermore, this study reported the rising number of c-sections among private for-profit hospitals due to financial incentives related to physicians' payment schemes. Moreover, instead of the long waiting time for vaginal delivery, formally or informally, physicians were pressured into recommending medical procedures, such as c-sections, which increase profit and facilitate better time management.<sup>[12,14]</sup>

**3.2.2. C-section per maternal request.** The increase in the number of c-sections is attributable to complex factors that are based on clinical and nonclinical reasons, including the convenience of pregnant women or clinicians, fear of suffering labor pain, and social demands.<sup>[22]</sup> Anxiety and fear of labor pain have also influenced the c-section rate, with epidural analgesia suggested to effectively reduce c-section events.<sup>[23,33]</sup> Moreover,



**Figure 1.** PRISMA flow diagram for the systematic review showing the study search, selection, and extraction processes. CS = cesarean section, PRISMA = Preferred Reporting Items for Systematic reviews and Meta-Analyses.

the levels of antepartum depression and anxiety are higher among mothers requesting ECS than among those who choose vaginal delivery.<sup>[26]</sup> Another reason for undergoing an ECS was the wife's and husband's body image perception associated with the fear that labor would damage the genitalia and cause vaginal relaxation syndrome (vaginal laxity), in which the vagina loses moisture and elasticity.<sup>[23]</sup>

Another study was based on debates among stakeholders, maternity care providers, the general public, physicians, and pregnant women, who expressed interest in opinions on autonomous choice to undergo c-sections among women.<sup>[28]</sup> While it varied among countries, obstetricians were the most supportive of c-section per maternal request (CSMR).<sup>[28]</sup>

Another factor that may be involved in the increasing incidence of unnecessary emergency c-sections is unsuccessful efforts to reduce adverse neonatal and maternal outcomes by increasing

the accuracy of electronic fetal heart monitoring (cardiotocography, fetal scalp pH analysis, fetal pulse oximetry, fetal heart electrocardiogram, and computerized cardiotocography).<sup>[29]</sup>

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

**3.3.1. Financial strategy to cope with budget overruns in medical spending.** Current clinical guidelines are insufficient for counteracting the increasing c-section rates in many health services.<sup>[12]</sup> Thus, the establishment of an evidence-based, clear clinical guideline is believed to be the first step toward improving decision-making in clinical settings. Moreover, adjusting financial incentives and improving care goals through an effective cost strategy are equally important. There should

Table 1		Findings in the critical appraisal of the included studies.																																																					
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		Medrzycka-Dąbrowska, et al <sup>[11]</sup>			Hoxha et al <sup>[12]</sup>			Hoxha et al <sup>[13]</sup>			Cai et al <sup>[24]</sup>			Yang et al <sup>[15]</sup>			Mathauer <sup>[16]</sup>			Kennedy et al <sup>[17]</sup>			Dodd et al <sup>[24]</sup>			Boatin et al <sup>[18]</sup>			Melkie et al <sup>[19]</sup>			Elsanipoor et al <sup>[21]</sup>			Chen et al <sup>[21]</sup>			Kingdon et al <sup>[28]</sup>			Loke et al <sup>[28]</sup>			Kingdon et al <sup>[31]</sup>			Wattar et al <sup>[29]</sup>			Oyugi et al <sup>[30]</sup>			Jalali Ahangar et al <sup>[30]</sup>		
Criteria		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)																												
Is the review question clearly and explicitly stated?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y																												
Were the inclusion criteria appropriate for the review question?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y																												
Was the search strategy appropriate?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	UC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y																												
Were the sources and resources used to search for studies adequate?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y																												
Were the criteria for appraising studies appropriate?	Y	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	Y	UC	UC	Y	Y	UC	Y	UC	Y	Y	Y	UC	Y	Y	Y																												
Did 2 or more reviewers conduct critical appraisal independently?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y																												
Were there methods to minimize errors in data extraction?	N	Y	N	Y	Y	Y	Y	Y	UC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	UC	Y	Y	UC	UC	Y																												
Were the methods used to combine studies appropriate?	Y	Y	Y	Y	Y	Y	Y	Y	UC	Y	Y	UC	Y	Y	Y	Y	Y	Y	Y	Y	Y	UC	Y	Y	UC	UC	Y																												
Was the likelihood of publication bias assessed?	N	Y	N	N	N	N	N	Y	N	N	Y	N	Y	Y	N	N	Y	Y	Y	N	N	N	N	N	N	N	N																												
Were recommendations for policy and/or practice supported by the reported data?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y																												
Were the specific directives for new research appropriate?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y																												

N = no, NA = not applicable, UC = unclear, Y = yes.



be penalties for hospitals that fail to maintain a low c-section rate. Financial incentives are expected to influence the identified correlation. Private for-profit institutions may establish financial incentive structures that promote more resource-intensive and costly operations to increase their revenue. The remuneration structure for hospitals and physicians is a significant factor. Reimbursement based on fee-for-service models may be prevalent in private for-profit hospitals, thus incentivizing these institutions and physicians to conduct a larger number of procedures than clinically warranted; this intensifies the time constraints for physicians pressuring them to opt for c-sections rather than allowing for the prolonged waiting time associated with normal deliveries. Health insurers may promote the excessive provision of c-section, as they often offer higher reimbursement rates to hospitals and physicians for c-section deliveries than for vaginal births. Ultimately, private for-profit hospitals generally have a greater number of qualified physicians, enhanced resources, and superior infrastructure.

The ultimate goals of all health service centers should include effectively using financial resources, preventing unnecessary c-sections, and improving health outcomes of mothers and newborns.<sup>[12,16]</sup> The direct and indirect costs are a financial burden, as they may be associated with occupancy, surgical complications, and postsurgical care, including rehabilitation.<sup>[27]</sup>

Another prevention strategy for decreasing the c-section rate is to develop an equal reimbursement policy for vaginal and c-section delivery, as higher c-section fees motivate physicians.<sup>[12,14]</sup> It has been suggested that to lower the likelihood of c-sections, the reimbursement arrangements among insurance providers should not include different payments for c-section and vaginal delivery<sup>[14]</sup> and should adopt a mechanism of financial management based on risk-sharing and healthcare financial burden.<sup>[36]</sup> Additionally, another study highlighted that the healthcare providers' financial management measures, such as prescribing a generic drug, preventing unnecessary diagnostic tests, and preventing unnecessary admission to intensive care departments, could indirectly reduce out-of-pocket expenses.<sup>[30]</sup>

**3.3.2. Nonfinancial strategy to overcome budget overruns for medical costs associated with increased c-section rates.** The term “non-financial strategy” describes other actions to screen and decide which medical procedures should be performed to drive efficient spending and reduce potentially unnecessary procedures. The Robson classification was one of the tools adopted to perform clinical audit cycles addressing c-section reduction.<sup>[18]</sup> Another study reported the effects of IV fluid management on reducing the c-section rate, specifically using IV fluids at 250 mL/h compared to the standard 125 mL/h.<sup>[20]</sup> This study reported on the role of IV fluids in increasing hydration among patients with restricted oral intake during labor. However, the type of hospital, such as a teaching hospital, was associated with a lower c-section likelihood due to the clinical standards applied; greater opportunity and access to resources, technology, and care; stronger accountability; and professional consultation.<sup>[13]</sup>

Additionally, alternative factors, such as the health delivery system, hospital facilities management, and organizational factors, are known to significantly reduce the c-section rate.<sup>[22]</sup> Education plays a role in lowering anxiety by enhancing knowledge and transforming beliefs, thereby increasing the mothers' confidence through the labor process.<sup>[31]</sup> This type of information prior to delivery plays an important role in decision-making regarding the mode of birth by women with access to numerous information sources, adequate emotional support, and dialogue sessions with health professionals through childbirth training workshops and nurse-led relaxation training programs.<sup>[21,31]</sup> However, maternal assistance programs, such as pelvic floor muscle exercises, cognitive behavioral therapy, childbirth class education, and interactive discussion, do not significantly affect c-section rates.<sup>[21]</sup>

Another nonfinancial approach to reducing the c-section rate is the application of free maternity policies that enable women to access MTCT disease screening, antenatal vital statistics checkup, perinatal complication reduction, and immunization coverage.<sup>[35]</sup>

## 4. Discussion

This study uncovered evidence supporting the use of Robson classification in clinical audit cycles to decrease the rate of c-sections. The alternative approaches to reducing the rate were primarily centered on the implementation of financial methods at both national and local levels within the hospital environment. While the increasing global trend in c-sections is well-known, disparities in socioeconomic aspects among low-middle-income countries have led to its overuse in these countries.<sup>[37]</sup> This systematic review adopted a conceptual approach that considered the root cause of the trend in increasing c-sections, analyzed whether the increasing number of c-sections was medically necessary or unnecessary, and provided solutions on potential strategies to overcome the current problem. Relevant evidence-based research synthesis identified outcome factors underlying the decisions to perform c-sections, especially obesity, failed induction, respiratory distress syndrome, MTCT, and other Robson classifications, such as a breech presentation. Unnecessary c-sections were associated with financial incentives and CSMR, necessitating a financial strategy response governed by the policymakers.

Compared to nonprofit hospitals, private or for-profit institutions are more likely to accept CSMR.<sup>[12]</sup> The issue of incentives in the financial scheme was recognized as an important factor responsible for the increasing rate of c-sections. Therefore, a provision on incentive arrangements should be established.<sup>[12]</sup> One study recommended using clinical audit cycles to enhance the standard of care provided to patients and outcomes of medical care.<sup>[18]</sup> This clinical audit function is in line with the recommendations of a previous study that aimed to promote improvements and suitable clinical applications using Robson classification.<sup>[38]</sup> This classification serves as a valuable tool for auditing c-sections and can be readily used at several levels, including institutional, state, national, and international, to compare c-section rates. A regular analysis of the indications for c-section among significant contributors and primary groups is necessary, and standardized techniques are recommended.

Addressing increasing c-section rates should be considered an important goal, as discussed in the 13 studies investigating a comprehensive financial and nonfinancial approach to control and decrease c-section rates. The current problem associated with financial costs is that c-section is more expensive than vaginal delivery. Providing equal rewards for c-section and vaginal delivery would be a solution for decreasing c-section rates and would be consistent with the proposed methods for lowering the rates of specific healthcare procedures, such as point-of-care service delivery, to increase demand for healthcare and expand healthcare use. An example of its application would be to provide financial incentives to hospitals that have the lowest c-section rates. Furthermore, the current harmony between extensive healthcare costs and the policymakers' goal of providing medical care access should be highly concerning.<sup>[39]</sup> A cost-effective criterion should be used to evaluate the use of particular medical care and determine whether it will be covered by national health insurance, as was accomplished in the United Kingdom.<sup>[39]</sup>

Several studies have proposed that financial rewards should be provided to reduce c-sections, integrated with better maternal and neonatal outcomes. Ensuring equal access for the whole community and equity in healthcare system funding is as important as providing healthcare with adequate financial

resources, such as social health insurance (community-based health insurance), general taxation, private health insurance, and reimbursement for out-of-pocket spending, provided by the financial health system.<sup>[40–43]</sup> Several potential methods can be used to reduce out-of-pocket spending, such as subsidies for medical care, use of optional generic drugs, drug pricing control strategy, performance-based payments, and implementation of a monitoring standard and healthcare policies that strengthen the protection of the financial system.<sup>[30,44,45]</sup>

#### 4.1. Strength and limitations

This study has some limitations, particularly in terms of study selection; specifically, the researchers did not explore studies from gray literature. Therefore, unpublished reports may have been overlooked. The predominant bias associated with systematic reviews may mostly originate from the handling of biomedical science datasets. It may encompass a singular cause or variety of random/systematic errors (e.g., dataset collection, data analysis, and data extrapolation and interpretation) predicated on plausible assumptions and variables, including disparities in the target population and extrapolation to a risk group, community, or population.<sup>[46]</sup>

However, in this study, various other standards for conducting systematic reviews and performing a uniform data analysis were applied to obtain and report impartial findings. To mitigate bias, it is advantageous to initially develop a checklist grounded in consensus and established guidelines for reading, assignment, data collection/extraction, analysis, and data extrapolation and interpretation.

Moreover, since these studies involved significant heterogeneity in terms of study design, population characteristics, and outcome measures, the overall conclusion may have been affected. Considering the multifaceted studies collected, pooling or correlating the overall consequences was barely possible. Lastly, the review only included studies published in English up to December 2021, and studies in other languages or more recent research might offer new insights.

However, this study has major strengths, particularly its broad search for evidence through methods, such as duplicate screening and data extraction, rigorous screening to exclude a wide range of biases in studies, and further analysis on each study characteristic as a potential reference of variation among studies.

#### 4.2. Implications for practice and future research

This study suggests that the formulation of a specific policy on public health concerns, focusing on financial management and regular screening audit cycles for c-sections, is required. Determining reimbursement levels between private and government-based hospitals is also required to decrease c-section delivery requests. Longitudinal studies are needed to assess the long-term impact of financial strategies on c-section rates and maternal and neonatal outcomes. Lastly, there is a need to include studies from a broader range of countries, especially low-middle-income countries, to enhance the generalizability of the findings.

### 5. Conclusions

The results of this study suggest that the increasing rate of c-section delivery worldwide must be addressed by assessing particular medical and social risk factors. This study recommends evidence-based findings to address each factor, particularly highlighting potential financial management that could be used in the health services system. These findings provide recommendations for further research to establish a comprehensive public health policy centered on a financial approach for reducing c-section incidence.

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