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INTERVENTIONS TO REDUCE CAESAREAN SECTION UTILIZATION RATE: A LITERATURE REVIEW

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KEYWORDS
Caesarean Section, Interventions, Reduce Caesarean Section rate, Public Health.

ABSTRACT
Objective: This paper aims to review and synthetize findings of interventions or policies to reduce caesarean section utilization rates.
Methods: A literature review was conducted by searching database with a systematic approach from two electronic databases (PubMed and ScienceDirect) starting January 2010 up to 31 December 2022.
Results: 1313 records were screened and 50 articles were selected to be reviewed, 1263 articles were excluded after screening for duplication and reviewing the title or abstract of the articles. All the 50 articles included in the review will be analyzed to study further about the intervention in reducing caesarean sections.
Conclusions: There are clinical or non-clinical interventions to reduce caesarean sections rate that already been done in many countries. All interventions need multi-stakeholder strong commitment and participations to ensure the success of each intervention.

INTRODUCTION

The increasing caesarean section (cs) rates in all over the world has become global public health concern. When medically justified caesarean sections can effectively prevent maternal and infant morbidity. The international healthcare community has the ideal rate 10-15% of caesarean section, however the rate seems keep increasing along the time. (1)

From 150 countries, an average of 18.6% of deliveries were carried out caesarean section as the delivery method, which ranges from 6% to 27.2%. The highest cs rate is in Latin American and Caribbean countries, namely 40.5%, followed by the Oceania region (31.1%), Europe (25%), Asia (19.2%), and Africa (7, 3%). Meanwhile, the highest cs trend increase was in Latin America and the Caribbean Islands, namely 19.4%, then the next highest increase was Asia, namely 15.1% and then the Oceania region (14.1%), Europe (13.8%), North America (10%). (2)

Many studies try to find the factors driving the phenomenon of increasing caesarean section rate. There are many factors related to the increasing of cs rates. From a medical perspective, the factors most often found in primary caesarean sections include obstructed labor, fetal distress as indicated by fetal heart rate abnormalities, fetal malpresentation, more than one fetus, and suspected macrosomia in the fetus. (3) From mother perspective, factors that causes women to choose caesarean section is history of previous caesarean delivery, women who live in middle income countries, multiparous (history of previous births with or without the cs method). Other factors that influence cs delivery are a history of difficulties in previous pregnancy, more than one fetus, and mother's personal request to give birth with caesarean section method. In terms of health workers, research in China shows that doctors prefer to perform cs deliveries rather than vaginal deliveries, one of which is because they are driven by higher financial factors for cs. (4–6)

Since unnecessary caesarean sections are known as very risky procedure for both mothers and newborn, many countries have developed interventions with the purpose to decrease the cs rate. The intervention including clinical and non-clinical intervention. Some interventions may not directly impact on reducing caesarean section rates. Therefore, it is necessary to provide an overview from many interventions to reduce caesarean section rates from all over the world. Thus, we conducted a literature review to answer research question: What kind of interventions and what supporting factors can optimize the reduction in caesarean section rates?

METHOD

This literature review aims to collecting and understanding findings or information based on the relevant research regarding interventions to reduce caesarean section rate.

Search Strategy:

A literature search conducted starting 1 January 2010 up to 31 December 2022 from two electronic databases (PubMed and ScienceDirect). Both databases were searched for the same frame time. The search terminology was set up as follows; ("Intervention" AND "To Reduce" AND "Caesarean Section" AND "Utilization").

Eligibility Criteria:

Inclusion Criteria: In English; published 2010-2022; abstract/full paper accessible; described the alternative or the intervention to reduce caesarean section and conclude the outcome of the intervention; no restriction was made regarding the type of study design.

Exclusion criteria: Not in English; abstract not accessible; did not describe the outcome of the intervention.

Study Selection:

All results were exported to Rayyan. Duplicates were removed before screening. After removing duplicates, eligibility screening was initiated. Initially, titles and abstract were independently reviewed to search the most relevant articles to meet the objective of the paper. Afterward, full text literature studies that meet eligibility criteria will be included and those that do not meet the criteria will be removed.

Data Extraction and Synthesis

Data collection will be carried out in all included studies. Data extraction and evaluations were organized and summarize according to: 1). Author, 2). Year, 3). Country, 4). Study design, 5). Interventions, 6). Type of interventions (Clinical/Non-Clinical), 7). Reported Impact of Interventions. Data synthesis collection will be presented in table form.

RESULT

Search and Screening Results

The initial database search identified 1313 records. After duplication removal and general screening of abstract and title only 103 studies remaining. Further abstract screening resulted in 75 full articles. 21 articles were excluded for following reasons: were only identifying factors contribute in increasing caesarean sections and were not analyzing about the interventions to reduce caesarean sections as the main objectives. After screening these, only 50 original articles selected. An overview of the article selection is shown in table 1.

Included articles characteristics

The total 50 articles included were published between 2014 and 2022.

Table 1. Collection Data of Studies sorted by publication date

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
1	Phipps H et all (7)	Prophylactic manual rotation for fetal malposition to reduce operative delivery.	2014	Australia	Literature Review	Prophylactic manual rotation in labour for fetal malposition	Clinical Intervention	There is insufficient evidence to determine the efficacy of prophylactic manual rotation early in the second stage of labour for prevention of caesarean delivery.
2	Indraccolo U et all (8)	Cesarean section on maternal request: should it be formally prohibited in Italy?	2015	Italy	Quantitative study from 5 questions Questionnaire	Formal prohibition of Caesarean Section on maternal Request (CSMR) in Italy	Non clinical Intervention	Not yet showing the data how the intervention can reduce the rate of caesarean section.
3	Ayres D et all (9)	Lowered national cesarean section rates after a concerted action.	2015	Portugal	Retrospective Observational	A concerted action directed mainly at state-owned hospitals, based on the transmission of information and training of healthcare professionals, together with the inclusion of CS rate reduction targets as	Non clinical Intervention	Significantly decreasing Caesarean Section rates in both regional and national.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
						a criteria for hospital funding		
4	Chaillet N et all (10)	A cluster randomized trial to reduce cesarean delivery rates in Quebec	2015	Canada	Quarisma trial, Cluster-randomized, controlled trial	Audits of indications for cesarean delivery, provision of feedback to health professionals, and implementation of best practices	Non clinical intervention	There was significant but small reduction in the rate of caesarean deliveries among women with low-risk pregnancy.
5	Poyatos LR et all (11)	Effects of exercise during pregnancy on mode of delivery: a meta-analysis.	2015	Many countries	Systematic review and meta-analysis	Regular physical exercise on pregnancy during the second and third trimester for healthy pregnant women	Non clinical intervention	Regular physical exercise on pregnancy during the second and third trimester for healthy pregnant women reduces caesarean delivery rates.
6	Davey MA et all (12)	Caesarean section following induction of labour in uncomplicated first births- a population-based cross-sectional analysis of 42,950 births.	2016	Australia	Systematic Review	Induction of labor in medically uncomplicated nulliparous women at term	Clinical Intervention	Induction of labor in medically uncomplicated nulliparous women Increasing the risk of emergency CS.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
7	Blomberg M (13)	Avoiding the first cesarean section--results of structured organizational and cultural changes.	2016	Sweden	Quantitative Study	Implementing nine-item list such as: recruitment of a midwife coordinator, risk classification of women, introduction of three different midwife competence levels, improved teamwork, obstetrical morning round, fetal monitoring skills, obstetrical skills training, and public promotion of the strategy.	Non clinical Intervention	The CS rates were declined after implementing the nine-item list intervention
8	Peng FS et all (14)	Impact of clinical audits on cesarean section rate.	2016	Taiwan	Retrospective study	Monthly Clinical Audits and feedback on CS cases. Especially CS with ambiguous indications were reviewed (audit) in detail.	Non clinical Intervention	The CS rate was significantly lower after the implementation of clinical audit and feedback.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
9	Plevani C et all (15)	Cesarean delivery rates and obstetric culture - an Italian register-based study.	2017	Italy	Retrospective study	An Obstetric practice that encourages vaginal instrument delivery in delayed second stage of labor or Vaginal Birth after Caesarean Section	Clinical intervention	intervention could reduce CS rates. The Intervention will require a change in Obstetric culture and continuing education of healthcare providers.
10	Johri M et all (16)	A cluster-randomized trial to reduce caesarean delivery rates in Quebec: cost-effectiveness analysis.	2017	Canada	Cluster-randomized trial	Clinical Audit, feedback, and implementation of best practices targeting health professionals	Non clinical intervention	Significantly but small reduction in Caesarean sections rate.
11	Burke N et all (17)	Prediction of cesarean delivery in the term nulliparous woman: results from the prospective, multicenter Genesis study.	2017	Ireland	Prospective Study	Developing five parameters (maternal age, BMI, height, fetal AC, and fetal HC) to determine the risk of CS in nulliparous women at term	Clinical intervention	Potential to assist in decision about mode of delivery
12	Yee LM et all (18)	Racial and Ethnic Differences in Utilization of Labor Management Strategies Intended	2017	USA	Observational Cohort	Application of labor management strategies such as failed induction, arrest dilation,	Clinical intervention	Application of labor management strategies could reduce the caesarean delivery rates.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
		to Reduce Cesarean Delivery Rates.				arrest of descent, and cervical ripening		
13	Kingdon C et all (19)	Non-clinical interventions to reduce unnecessary caesarean section targeted at organizations, facilities and systems: Systematic review of qualitative studies	2018	Many countries	Qualitative study	The role of stakeholders in concerning about leadership and followership, multidisciplinary teamwork, effective training (including women's educational needs), collaboration and engagement. A system that do not perverse incentives to increase caesarean section	Non clinical intervention	The Non clinical intervention could reduce the CS rates.
14	Arendt E et all (20)	Effect of maternal height on caesarean section and neonatal mortality rates in sub-Saharan Africa: An analysis of 34 national datasets.	2018	Africa	Multivariate logistic regression	Developing policies targeting stunting in infant girls and potential catch-up growth in adolescence and early adulthood to increase adult height	Non clinical intervention	Intervention could reduce potential CS rates in the future.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
15	Boatin AA et all (21)	Audit and feedback using the Robson classification to reduce caesarean section rates: a systematic review.	2018	Brazil, Chile, Italy, and Sweden	Systematic Review	Clinical audit using the Robson Classification	Non clinical intervention	The intervention by doing clinical audit using the Robson Classification showed decreasing in CS rates.
16	Cantone D et all (22)	A standardized antenatal class reduces the rate of cesarean section in southern Italy: A retrospective cohort study.	2018	Italy	Retrospective Cohort Study	Implementing Standardized antenatal class (12 meetings, 11 in pregnancy and 1 in postpartum), lasted for 3 hours which conducted by multidisciplinary team in each meeting	Non clinical intervention	Significantly reduce CS rates.
17	Kingdon C et all (23)	Women's and communities' views of targeted educational interventions to reduce unnecessary caesarean section: a qualitative evidence synthesis.	2018	High income countries	Qualitative evidence synthesis	Educational intervention, emotional support, and dialogue with professional regarding information about mode of delivery.	Non clinical intervention	Not yet showing data regarding the impact of intervention
18	Chen I et all (24)	Non-clinical interventions for reducing	2018	High income countries	Cochrane Review	Implementing New WHO Guideline to	Non clinical intervention	Few interventions with moderate- or high-certainty evidence, mainly targeting

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
		unnecessary caesarean section.				reduce unnecessary CS rates.		healthcare professionals (implementation of guidelines combined with mandatory second opinion, implementation of guidelines combined with audit and feedback, physician education by local opinion leader) have been shown to safely reduce caesarean section rates.
19	Betran AP et all (25)	Interventions to reduce unnecessary caesarean sections in healthy women and babies	2018	Many Countries	Literature review	Clinical interventions (external cephalic version for breech delivery at term, vaginal breech delivery in appropriately selected women, and vaginal birth after CS) and Non clinical intervention (labour companionship and midwife-led care, Investing in the training of health	Clinical and non-clinical intervention	Interventions to reduce overuse of CS rates must be multicomponent and locally tailored, addressing women's and health professionals' concerns, as well as health system and financial factors.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
						professionals, eliminating financial incentives for CS use, and reducing fear of litigation is fundamental)		
20	Kingdon C et all (26)	Interventions targeted at health professionals to reduce unnecessary caesarean sections: a qualitative evidence synthesis.	2018	Many Countries	Qualitative Evidence Selection	Change programmes for health professionals need to act on personal beliefs, local norms and control beliefs about birth.	Non clinical intervention	Showing a synergetic relationship to reduce caesarean rates.
21	Behzadifar M et all (27)	The effect of the health transformation plan on cesarean section in Iran: a systematic review of the literature.	2019	Iran	Systematic Review	Health Transformation Plan to reduce CS by 10% and promote vaginal delivery	Non clinical intervention	Decreased in CS rates in Iran after implementing the policy after about 4 years.
22	Rise E et all (28)	Is there any association between abdominal strength and Child Cohort Study.	2019	Norway	Prospective population-based Cohort	Implementing regular abdominal strength training before and during pregnancy	Clinical Intervention	No association showed between intervention and CS rates reduction.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
23	Kabore C et all (29)	DECIDE: a cluster-randomized controlled trial to reduce unnecessary caesarean deliveries in Burkina Faso.	2019	Burkina Faso, Africa	Randomized controlled trial	The use of clinical algorithms, audits, and feedback of CS indication and SMS reminders	Non clinical intervention	A significant reduction in the percentage of unnecessary caesarean deliveries.
24	Meng Z et all (30)	Cesarean delivery rates, costs and readmission of childbirth in the new cooperative medical scheme after implementation of an episode-based bundled payment (EBP) policy.	2019	China	Natural experiment design	Implementing Episode-based bundled payment (EBP) policy	Non clinical intervention	Showing a short-term success in lowering the increase of cesarean delivery rate and costs of childbirth
25	Nasreen HE et all (31)	Impact of maternal antepartum depressive and anxiety symptoms on birth outcomes and mode of delivery: a prospective cohort study in east and west coasts of Malaysia.	2019	Malaysia	Prospective cohort	Antepartum Depressive and Anxiety Symptoms identification and management during antenatal check-up regarding Caesarean delivery	Non clinical intervention	Antepartum depressive associated with the risk of CS deliveries.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
26	Gao Y et all (32)	Does attendance of a prenatal education course reduce rates of caesarean section on maternal request? A questionnaire study in a tertiary women hospital in Shanghai, China.	2019	China	Questionnaire study	Promotion of Prenatal Education to reduce CS on maternal request	Non clinical intervention	attendance of a prenatal education course significantly reduced the rate of caesarean section on maternal request.
27	Xia X et all (33)	Effect of a two-stage intervention package on the cesarean section rate in Guangzhou, China: A before-and-after study.	2019	China	Retrospective repeated Cross-sectional study	Two-stage intervention package (a comprehensive health promotion program aiming to control and reduce maternal and infant mortality and population health education, skills training to healthcare professionals, equipment and technical support for local healthcare facilities, and capacity building	Non clinical intervention	Apparent decline in the overall CS rate after the implementation of the intervention.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
						for the maternal near-miss care system)		
28	Chapman A et all (34)	Maternity service organizational interventions that aim to reduce caesarean section: a systematic review and meta-analyses.	2019	Many countries	Systematic Review and meta-analysis	Implementation of midwife-led models of care, audit and feedback, and a hospital policy of mandatory second opinion for CS	Clinical and non-clinical intervention	Midwife-led models of care, audit and feedback, and a hospital policy of mandatory second opinion for CS are potential intervention to reduce CS rates.
29	Brenes M et all (35)	Are overweight and obesity associated with increased risk of cesarean delivery in Mexico? A cross-sectional study from the National Survey of Health and Nutrition.	2019	Mexico	Cross sectional study	Developing policy to reduce obesity and overweight pregnant women in Mexico	Clinical intervention	Not yet showing the data of the intervention's impact.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
30	Yu Y et all (36)	The effectiveness of financial intervention strategies for reducing caesarean section rates: a systematic review.	2019	Many countries	systematic review	Financial intervention such as co-payment, diagnosis-related group payment system for CS and a risk-adjusted capitation for CS	Non clinical intervention	Risk- adjusted payment methods looks promising in reducing CS rates.
31	Liu Y et all (37)	Using healthcare failure mode and effect analysis as a method of vaginal birth after caesarean section management.	2020	China	Failure mode and effect analysis	Implementing trial of labor after caesarean section	Clinical intervention	CS rate reduce and vaginal birth after caesarean section rate after the implementation
32	Sun N et all (38)	Factors associated with Chinese pregnant women's preference for a cesarean section based on the theory of planned behaviour.	2020	China	Cross sectional	Implementing theory of planned behaviour to comprehensively determine the factors regarding pregnant women's preference for caesarean section (caesarean delivery on maternal request)	Non clinical intervention	CS rates could be reduced after implementing the theory of planned behavior in pregnant women.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
33	Zhang L et all (39)	A cluster-randomized field trial to reduce cesarean section rates with a multifaceted intervention in Shanghai, China.	2020	China	Cluster-randomized field trial	Targeted health education to pregnant women, improved hospital CS policy, and training of midwives/doulas for 8 months	Non clinical intervention	The intervention did not significantly reduce the CS rate
34	Kacerauskiene J et all (40)	Lithuania's experience in reducing caesarean sections among nulliparas: the Lithuania's experience in reducing caesarean sections among nulliparas: the impact of the quality improvement course.	2020	Lithuania	Quantitative study	Implementing national quality improvement course (QIC) for obstetrical skills improvement was organized for obstetric staff involved in intra-partum care.	Clinical intervention	The intervention were show positive impact to reduce the overuse of medically unnecessary CS.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
35	Tarimo CS et all (41)	Prevalence and risk factors for caesarean delivery following labor induction at a tertiary hospital in North Tanzania: a retrospective cohort study (2000-2015).	2020	Tanzania	Retrospective cohort study	Assessment of primiparity patients, high birthweight, post-dates and urban residence along with labour induction intervention	Clinical intervention	Reducing adverse pregnancy outcomes associated with emergency Caesarean delivery.
36	Nascimento et all (42)	Metformin for prevention of cesarean delivery and large-for-gestational-age newborns in non-diabetic obese pregnant women: a randomized clinical trial.	2020	Brazil	Randomized clinical trial	The use of lower dosage of metformin in non-diabetic obese pregnant women.	Clinical intervention	The use of metformin reduced caesarean section rates.
37	Negrini et all (43)	Reducing caesarean rates in a public maternity hospital by implementing a plan of action: a quality improvement report.	2020	Brazil	Quality improvement report using SQUIRE 2.0 guidelines	Implementing model of actions (encouragement of labour analgesia; execution of written reports of any cardiotocographic examination; plan-do-study-act cycles	Clinical and non-clinical trial	Reduction of CS rates after implementation of the intervention

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
						for nursing orientations about the positions that favour pregnant women during labour; creation of a birth induction form; monthly feedback with physicians and nurses on caesarean rates achieved; verification of the caesarean rate by medical staff with individual feedback; daily round of medical coordination for case discussions; disclosure of caesarean rates on hospital posters.		
38	Opiyo N et all (44)	Reducing unnecessary caesarean sections: scoping review of financial and	2020	Low, Middle, high-income countries	Scoping Review	- Financial Intervention: equalizing physician reimbursement fees for vaginal	Non clinical intervention	Diverse financial and legislative strategies intended to reduce CS rates.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
		regulatory interventions.				and caesarean delivery. - Health organization payment methods: DRG payment system; global budget payment system; case-based payment system; cap-based payment system; - Other financial interventions: Financial incentive and free vaginal delivery policy.		
39	Bhartia A et all (45)	Reducing caesarean section rate in an urban hospital serving women attending privately in India - a quality improvement initiative.	2020	India	Quantitative study	Implementation of hiring full time obstetricians, on a fixed salary, joining an improvement collaborative, improving labor ward support.	Non clinical intervention	The intervention could reduce CS rate.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
40	Augustin H et all (46)	Late Pregnancy Vitamin D Deficiency is Associated with Doubled Odds of Birth Asphyxia and Emergency Caesarean Section: A Prospective Cohort Study.	2020	Sweden	Prospective cohort study	Prevention of vitamin D deficiency among pregnant women	Clinical intervention	Prevention of vitamin D deficiency among pregnant women can reduce risk of emergency Caesarean delivery.
41	Su Y et all (47)	Effect of a Text Messaging-Based Educational Intervention on Cesarean Section Rates Among Pregnant Women in China: Quasirandomized Controlled Trial.	2020	China	**Quasi-randomized** Controlled Trial	Sending pregnant women short informational messages with integrated advice regarding both care seeking and good home prenatal practices.	Non clinical intervention	Intervention could reduce women's likelihood of undergoing caesarean section.
42	Laurita L et all (48)	An unnecessary cut? multilevel health systems analysis of drivers of caesarean sections rates in Italy: a systematic review.	2020	Italy	Systematic review	Developing synergetic multi-stakeholder intervention to encourage consensus between regional authorities and local governments and	Non clinical intervention	intervention could reduce the CS rates.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
						guide the systematic compliance of delivery units with its clinical guidelines.		
43	Tang Y et all (49)	Promotion of Pre-natal Education Courses Is Associated With Reducing the Rates of Caesarean Section: A Case-Control Study	2020	China	Case control study	Implementing pre-natal education course	Non clinical intervention	Attending of a pre-natal education course influences the mode of delivery and reduces the unnecessary caesarean section.
44	Hildebrand E et all (50)	Long-term effects of the nine-item list intervention on obstetric and neonatal outcomes in Robson group 1 - A time series study	2021	Sweden	Meta analysis	Intervention: the nine-item list (monitoring of obstetric result, midwife coordinator, Risk classification of women, three midwife competence level, teamwork, Obstetric morning round, Fetal monitoring skill, Obstetric skills	Clinical and non-clinical intervention	Implementation of the nine-item list increased the proportion of spontaneous vaginal deliveries by reducing the number of instrumental deliveries and CS.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
						training, public promotion of the strategy		
45	De Loenzien et all (51)	Women's empowerment and elective cesarean section for a single pregnancy: a population-based and multivariate study in Vietnam.	2021	Vietnam	Multivariate analysis	Developing policy to integrate women empowerment	Non clinical intervention	The policy could possibly reduce CS rate.
46	Huang L et all (52)	Association of gestational weight gain with cesarean section: a prospective birth cohort study in Southwest China.	2021	China	Cohort	Developing policy to pay attention to an excessive gestational weight gain for underweight women	Clinical intervention	The policy could reduce CS rate.
47	Zochowski et all (53)	Trends In Primary Cesarean Section Rates Among Women with And Without Perinatal Mood and Anxiety Disorders.	2021	USA	Cross sectional study	Developing Policy to identifying and evaluating meaningful clinical system or policy intervention to reduce perinatal mood and anxiety disorder	Clinical intervention	The policy could possibly reduce caesarean section rates.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
48	Bello O et all (54)	Utilizing the Robson 10-Group Classification System as an Audit Tool in Assessing the Soaring Caesarean Section Rates in Ibadan, Nigeria.	2021	Nigeria	Retrospective study	Intervention to focus on increasing the proportion of vaginal deliveries in women with a history of one CS.	Clinical intervention	Intervention could reduce caesarean section rates.
49	Gallagher L et all (55)	What would reduce caesarean section rates? views from pregnant women and clinicians in Ireland.	2022	Ireland	Qualitative Study	- Changing the culture that has 'normalised' CS, by listening to the shared views of clinicians and women. - Offering practical solutions for pregnant women and clinicians, such as: decreasing induction of labour rates; enhancing antenatal education;	Clinical and non-clinical intervention	The intervention could reduce CS rates.

No	Author	Title	Year	Country	Study Design	Interventions	Type of interventions	Reported Impact of Interventions
						offering strategies to support normal birth to all women; improving communication between clinicians and women; and increasing shared decision-making		
50	McDonald SM et all (56)	Influence of prenatal exercise on the relationship between maternal overweight and obesity and select delivery outcomes.	2022	USA	Randomized Controlled trial	Implementing Exercise before and during pregnancy for Overweight or Obese women (OWOB)	Non clinical intervention	Intervention could decrease the risk caesarean section for OWOB.

DISCUSSION

The main objective of this review was to provide findings regarding interventions to reduce caesarean section rate and important supporting factors to optimize the interventions. The result shows that clinicians and pregnant women believe that cs rates can be decreased if a shared philosophy supporting normal birth is prioritised alongside adequate resourcing along with enhanced communication with clinicians.(55)

There are systemic complexities, emphasizing some different drivers such as medical and non-medical factors contributing in the rise of cs rates. Some studies showed that the alignment of regional authorities with local governments and practitioners increased adherence to clinical guidelines to reduce cs rate. (48)

Interventions to reduce cs rate found in this literature review are clinical and non-clinical interventions. There are 15 clinical intervention to reduce cs rate, 30 non clinical intervention, and 5 intervention from both aspects (clinical and non-clinical) found in this literature review. Each aspect of intervention is discussed in the next section.

Clinical Interventions to reduce caesarean section rate

Caesarean delivery rates are rising due to multiple factors, in the medical perspective, factors such as elective induction of labor at term, fetal malposition, gestational diabetic mellitus, obesity or overweight, hypertension could contribute in increasing caesarean section rates. some countries developing interventions or policy to minimize factors that clinically affecting the risk of caesarean section delivery (7,12,15).

This study finds 15 clinical interventions to reduce caesarean section rates, such as:

1) Implementing Prophylactic manual rotation in labour for fetal malposition; (7)
2) Observing Induction of labor in medically uncomplicated nulliparous women at term; (12)
3) Encouraging vaginal instrument delivery in delayed second stage of labor or Vaginal Birth after Caesarean Section; (15)
4) Developing five parameters (maternal age, BMI, height, fetal AC, and fetal HC) to determine the risk of cs in nulliparous women at term; (17)
5) Developing application of labor management strategies such as failed induction, arrest dilation, arrest of descent, and cervical ripening; (18)
6) Implementing regular abdominal strength training before and during pregnancy; (28)
7) Developing policy to reduce obesity and overweight pregnant women;(35)
8) Implementing trial of labor after caesarean section; (37)
9) Implementing national quality improvement course (QIC) for obstetrical skills improvement was organized for obstetric staff involved in intra-partum care; (40)
10) Implementing assessment of primiparity patients, high birthweight, post-dates and urban residence along with labor induction intervention; (41)
11) Implementing the use of lower dosage of metformin in non-diabetic obese pregnant women; (43)
12) Implementing prevention of vitamin D deficiency among pregnant women; (46)
13) Developing policy to pay attention to an excessive gestational weight gain for underweight women; (52)
14) Developing Policy to identifying and evaluating meaningful clinical system or policy intervention to reduce perinatal mood and anxiety disorder; (53)
15) Intervention to focus on increasing the proportion of vaginal deliveries in women. (54)

There are some clinical interventions which significantly decreased the risk of caesarean section, but there are also some interventions showing no association in cs rates reduction.

Non-clinical intervention to reduce caesarean section rate

Many factors contributed in the rising of caesarean section rate from non-medical perspectives such as women tend to choose delivery by caesarean section due to fear of the

pain that occurs during normal delivery, the desire to immediately be able to have intimate relations with their partner after giving birth, and it is easier to determine the right time or date to give birth to their baby. From the clinician perspective factors such as difference financial incentives between caesarean delivery and vaginal birth contributing in rising the cs rates.(5,57)

This study shows several types of non-clinical intervention to reduce caesarean section rates, which are: financial intervention, national policy intervention to prohibit caesarean section on maternal request, health promoting intervention (like prenatal class standardization, regular physical exercise, and women empowerment), continuing education improvement for healthcare professionals, monthly clinical audit of indications and provision of feedback to health professionals regarding cs rates. (8–10,13)

Significant differences showed in several non-clinical interventions, however some conditions need to combine clinical and non-clinical interventions to reduce the rate of caesarean section.(42)

Factors affecting the success of implementing the intervention

Caesarean section delivery rates were increasing worldwide with wide differences within and between countries. Study showed that regulatory and legislative policy either clinical or non-clinical intervention may reduce unnecessary cs rate by minimizing the potential risk of related medical conditions of expecting mother undergoing cs, decreasing the discretion of individual clinicians to perform cs that were convenient for them, or regarding maternal request for cs in the absence of any medical indications.

Interventions to reduce overuse of CS rates must be multicomponent and locally tailored, addressing women's and health professionals' concerns, as well as health system and financial factors. (25)

CONCLUSION

There are no gold standard interventions for reducing caesarean section rate. Every intervention needs to be evaluated continuously and modified according to the contributing factors. More rigorous studies and new ways of assessing the impact of clinical and non-clinical interventions to reduce unnecessary caesarean section are needed.

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