REVIEW ARTICLE

Management and outcomes of breech presentation at term in Thailand: a systematic review and meta-analysis

Thitaporn Siriwan[1*], Shawn Walker[2]

[1] Obstetrics and midwifery nursing department, The Royal Thai Army Nursing College, Bangkok, Thailand
[2] Florence Nightingale Faculty of Nursing, Midwifery and Palliative Care, King's College London, London, UK

Corresponding Author Thitaporn Siriwan **Email:** thitaporn_s@rtanc.ac.th

Received: 18 November 2021 **Revised:** 17 January 2022 **Accepted:** 25 January 2022**Available online:** May 2022
DOI: 10.55131/jphd/2022/200222

ABSTRACT

There is a continuous debate on the management of term breech presentation (TBP) regarding the mode of delivery. Limited information about TBP and an absence of Thai national guidelines have led to differences in practices for the mode of delivery. This study aims to describe term breech management in Thailand, including the percentage of TBP and mode of delivery, external cephalic version (ECV) outcomes, and maternal and neonatal outcomes following cesarean section (CS) and vaginal breech birth (VBB). A comprehensive electronic database search was performed in MEDLINE, CINAHL, EMBASE, BNI, MIDIRS, CENTRAL, Scopus, PubMed and HINARI, ThaiJO and J Med Assoc Thai. All databases were searched for updates up to the 7th of April 2021 and reference lists of relevant studies were searched. Inclusion criteria consisted of primary studies assessing the management of TBP, including ECV (≥36 weeks' gestation) and mode of delivery at term (≥37 weeks' gestation); and studies that observed maternal or neonatal outcomes following mode of breech delivery in Thailand. The NICE methodology checklist for cohort studies was utilized to assess the risk of bias in individual studies. To synthesise the findings, a combination of meta-analysis and narrative synthesis was utilised, based on the research questions and data of the included studies. Ten studies with a total of 5112 women were included. TBP represented 89.78% of all breech deliveries in Thailand. The average success rate of ECV was high at 70%, with few complications reported and a CS rate reduction, although only in two small studies. Within the VBB group when compared with CS, the pooled estimates of neonatal outcomes including 1- and 5-minute Apgar score, birth trauma, NICU admission, neonatal death and subgroup perinatal death, showed higher risks, with only neonatal jaundice being lower. Maternal outcomes including puerperal fever and postpartum haemorrhage, indicated a lower risk following VBB compared to CS.

TBP was associated with an increased CS rate. A focus on this population could help to reduce the national CS rate. ECV as a standard practice would be a beneficial national policy. Controversies amongst mode of birth for TBP regarding neonatal and maternal outcomes remain, as existing evidence is of a very low quality. The evidence strongly supports a need for VBB skills training to improve neonatal outcomes, for planned or unplanned VBBs. Current approaches require reconsideration and standardization of practices and skills. Scaling up the quality and quantity of breech research in Thailand is needed, along with establishing the national guideline.

Key words:
term breech presentation; external cephalic version; caesarean section; vaginal breech birth; maternal and newborn outcome

Citation:
Thitaporn Siriwan, Shawn Walker. Management and Outcomes of Breech Presentation at Term in Thailand: A Systematic Review and Meta-Analysis. J Public Hlth Dev. 2022;20(2):312-336
(https://doi.org/10.55131/jphd/2022/200222)

INTRODUCTION

The global prevalence of breech presentation in singleton pregnancies at term is approximately 3% to 4% of all singleton births.[1,2] For decades, the mode of delivery for term singleton breech presentation has been controversial, especially in relation to perinatal and maternal outcomes.[3-6]

Mode of delivery trends dramatically changed in 2000 following the publication of the randomized international multicenter Term Breech Trial (TBT).[7] The TBT indicated that planned cesarean section (CS) is the safest mode of delivery for term breech presentation (TBP) due to lower perinatal-neonatal mortality and morbidity, compared with vaginal breech birth (VBB), with no difference in severe maternal complications between intervention groups.[7] Planned CS presents protective effects on perinatal mortality and short-term morbidities when compared to VBB[7], but not long-term morbidity.[8] Moreover, CS itself cannot eliminate all neonatal risks. Decisions regarding mode of delivery also need to consider the short and long-term maternal complications post CS and future reproductive intentions.[6]

External cephalic version (ECV) was introduced as an alternative intervention to planned CS for breech presentation near or at term.[10,11] The latest Cochrane review [11] indicates that ECV at or near term reduces the risks of CS and non-cephalic presentation compared with not attempting ECV. However, ECV prior to term can increase the risk of late preterm birth.[9] Other complications of ECV at term have been rarely reported,[6] suggesting that ECV is a relatively safe intervention with rare complications.[11-14] However, ECV is not routinely offered in many healthcare settings worldwide due to a skill deficit among healthcare providers.

The TBT demonstrated higher perinatal risks in the VBB group.[7] This has influenced the decline of VBB at term.[6,15] However, a large meta-analysis indicated a small absolute risk (AR) in VBB group in terms of perinatal mortality, fetal neurologic morbidity, birth trauma, 5-minute Apgar score < 7 and neonatal asphyxia (0.3, 0.7, 0.7, 2.4, and 3.3 % respectively).[16] Reduction of VBB has eroded vaginal breech delivery skills in healthcare professionals, whilst women who plan for CS sometimes start labour before scheduled CS[6], placing women and infants at a higher risk. Moreover, many studies suggest that planned VBB is still a safe route of delivery for term breech presentation (TBP) with the use of an adequate selection protocol and experienced healthcare professionals.[17-22] Additionally, long-term neurological delay is not increased following VBB.[21] Although, planned VBB contributes to lower maternal risks than CS, the risks of EmCS remain approximately 29%[17] to 45%.[23]

Although international evidence and guidelines exist, in Thailand minimal information is available on either common interventions or maternal and neonatal outcomes of TBPs, leading to a lack of evidence to guide practice in this setting. Absence of a national guideline for term breech management in Thailand has led to wide variations in practice across healthcare settings. Therefore, the choice of mode of birth in Thailand depends on healthcare providers and hospital policy rather than individual women's preferences or appropriate criteria. Evidence from high-resource settings for TBP management may not be applicable in low-resource settings.[24] Analysis of local data is required to establish national practical guidelines for term breech management.

This systematic review (SR) aims to synthesize the available evidence of breech management at term in Thailand, including

prevalence and modes of delivery for TBP, ECV rate and outcomes, and comparison of maternal and neonatal outcomes following modes of delivery of babies born breech at term. This will help to inform an initial Thai national practical guideline. This SR will also enable the identification of knowledge and practice gaps in term breech management, guiding further research and development of obstetricians' and midwives' skills.

METHODS

This study utilized SR methodology, which aims to collate evidence in order to answer a specific review question whilst minimizing bias through an explicit and transparent process.[25, 26] The review questions were "What is the percentage of TBP and mode of delivery (VBB versus CS) in Thailand?", "What are the success rate and outcomes of women provided with ECV in Thailand?" and "What is the difference in the maternal and neonatal outcomes of term breech presentation compared between VBB and CS in Thailand?". The questions were developed to achieve the aims and objectives of this study following the PICO components (Table 1).[27] This review follows the PRISMA statement and checklist to ensure transparent and complete reporting by the SR and meta-analysis.[28]

Studies were identified by selective electronic database searches using MEDLINE, CINAHL, EMBASE, BNI, MIDIRS, CENTRAL, Scopus, PubMed and HINARI. Additionally, Thai regional databases, including ThaiJO and J Med Assoc Thai, were added for the search and identification of relevant studies not available in major international databases. All databases were searched for updates up to the 7th of April 2021 and the reference lists of appropriate studies were scanned and hand searched to further identify potentially relevant studies. An example of a search history used in this study can be found at https://bit.ly/32UZtdq.

Table 1. Research questions structured by PICO components

Question 1: What are the success rate and outcomes of women provided with ECV in Thailand?			
Population	**Intervention**	**Comparison**	**Outcome**
Women with breech presentation in Thailand	External cephalic version (ECV)	No ECV	Success rate, complications, modes of birth
Question 2: What is the difference in the maternal and neonatal outcomes of term breech presentation compared between VBB and CS in Thailand?			
Population	**Intervention**	**Comparison**	**Outcome**
Women with breech presentation at term (≥ 37 weeks gestational age) in Thailand	Vaginal breech birth (VBB)/Vaginal breech delivery	Caesarean section	Maternal and neonatal outcomes

The search terms were developed from the review questions and included "Breech presentation" "Vaginal breech birth" "External cephalic version" "Cesarean section" "Perinatal mortality" "Pregnancy complication" "Maternal outcome" "Neonatal outcome" "Prevalence" and "Thailand". These terms were utilized (MeSH and synonyms) for all databases with Boolean variables

(OR/AND) and Truncations (*/$) to improve the sensitivity of the search results. Limitations such as language or type of publication were not applied in the search strategy.

Eligible studies for this review were as follows: primary studies that collected data from healthcare settings in Thailand; studies that assessed the management of singleton breech presentation at term, including ECV (≥36 weeks' gestation) and mode of delivery (VBB or CS) at term (≥ 37 weeks' gestation); and studies that observed maternal outcomes or perinatal mortality and morbidity following term delivery in breech presentation. Although RCT design is considered as the gold standard for medical research[29], both RCTs and observational studies were considered for eligibility due to paucity of RCT studies available.

Papers were excluded if they: did not separately report data of TBPs in Thailand; did not differentiate data on mode of delivery between babies that were born breech at term and preterm; only reported breech births as a risk factor of birth asphyxia without a comparison with the entire population; reported only fetal mortality and morbidity caused by intra uterine fetal death or lethal congenital anomalies; reported maternal outcomes including complications during pregnancy that were not related to the mode of delivery of TBP.

Bibliographic references were extracted from all studies identified, including authors, titles, year of publication and abstracts. These were exported to the Endnote reference program (version X9) for duplication removal. All single publication articles' titles and abstracts were screened by the reviewer for removal of irrelevant articles. Full texts of studies potentially relevant to the review questions were required to determine eligibility using identified criteria. When full-texts of the studies could not be accessed via electronic search platforms, these full-texts were requested from the corresponding authors and publishing journals. Full texts were screened by the primary reviewer (TS) and reviewed by the senior reviewer (SW). Studies published in Thai had key information translated into English to facilitate this process. The selection process implemented followed the steps of the PRISMA flow diagram (Figure 1).[28]

Data of the included studies were extracted by the primary reviewer (TS) and double-checked (SW). Extracted data included: the authors' names, article's title, year of publication, study design, year of data collection, objectives, inclusion and exclusion criteria, sample size, participant characteristics, percentage of TBP, ECV and the outcomes (success rate, mode of delivery and complications), mode of delivery of TBP (VBB or CS), maternal and neonatal outcomes.

The individual studies of this review were assessed for bias using the NICE methodology checklist for cohort studies[30], and incorporated with the rating of the quality of evidence assessment using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system[31], in order to consider the strength of recommendation.

This review synthesized data across three groups: percentage of TBP and mode of delivery; ECV rate and outcomes; and the maternal-neonatal outcomes following modes of delivery. This review utilised a combination of meta-analysis and narrative synthesis as appropriate, based on the design and data of included studies.

To address the review question of the comparison between VBB and CS in Thailand, a meta-analysis of observational studies[32] was utilised to synthesize the neonatal and maternal outcomes following the mode of delivery. This review used Review Manager (RevMan) version 5.3, advocated by the Cochrane Library[33], to

perform the meta-analysis using a random-effects model and inverse variance approach, which appropriated the heterogeneity across the included cohort studies.

RR (relative risk) and 95%CI (confidence interval) were produced from the dichotomous data extracted from the primary studies. These reported neonatal outcomes of Apgar score at 1- and 5-minute, birth trauma, NICU admission, perinatal death, neonatal jaundice, and maternal outcomes including puerperal fever, blood transfusion and postpartum hemorrhage. AR (Absolute risk) of neonatal and maternal outcomes were analysed and compared between the groups. Heterogeneity across the studies was calculated in form of the value of I square statistic (I^2) for each outcome analysis.

The sensitivity analysis was performed for the outcomes of 1- and 5-minute Apgar scores by excluding the studies which presented a significant imbalance of preterm and term breech presentations within and between groups.

This review was then synthesised narratively to include other studies together with meta-analysis to completely answer the review questions. In terms of percentage of TBP and mode of delivery, ECV outcomes (success rate, mode of birth and complications), as well as the study where meta-analysis could not be applied, data were tabulated to include the number and percentage. A narrative approach was used to provide a summary of the evidence.

RESULTS

The search identified a total of 197 records, of which 196 came from database searches and 1 from manual searching of relevant reference lists (Figure 1). Duplicated studies were removed using the EndNote reference management software and manually rechecked. Subsequently, the titles and abstracts were screened and full texts of 26 studies were assessed against the eligibility criteria. Summary translations of the 3 articles published in Thai were provided by the native speaker reviewer. Studies of ambiguous relevance were resolved through discussion amongst the review team. Of the 26 eligible studies, 16 studies were excluded for various reasons leaving 10 studies for data extraction that met eligibility criteria.

The studies included were published between 1990-2019. There are eight retrospective cohort studies[35,37-43] on the mode of delivery of TBP, and two prospective cohort studies reporting ECV rate and outcomes.[36,44] Some included studies recruited the participants delivered at term and preterm, but separately reported the mode of birth of TBP.[35,38,39-42] Of the 5112 participants in the included studies, there were 4435 TBPs. Of the eight studies that reported modes of term breech delivery, seven reported term VBB rate and all eight studies reported CS rate. Only one study differentiated ElCS and EmCS breech deliveries.[37] The outcomes of included studies were categorised into maternal and neonatal outcomes. Six studies assessed maternal outcomes and eight studies assessed neonatal outcomes following the mode of breech delivery. Seven studies compared VBB and CS, and one study compared ElCS and EmCS for TBP. Key features and findings were extracted (Table 2).

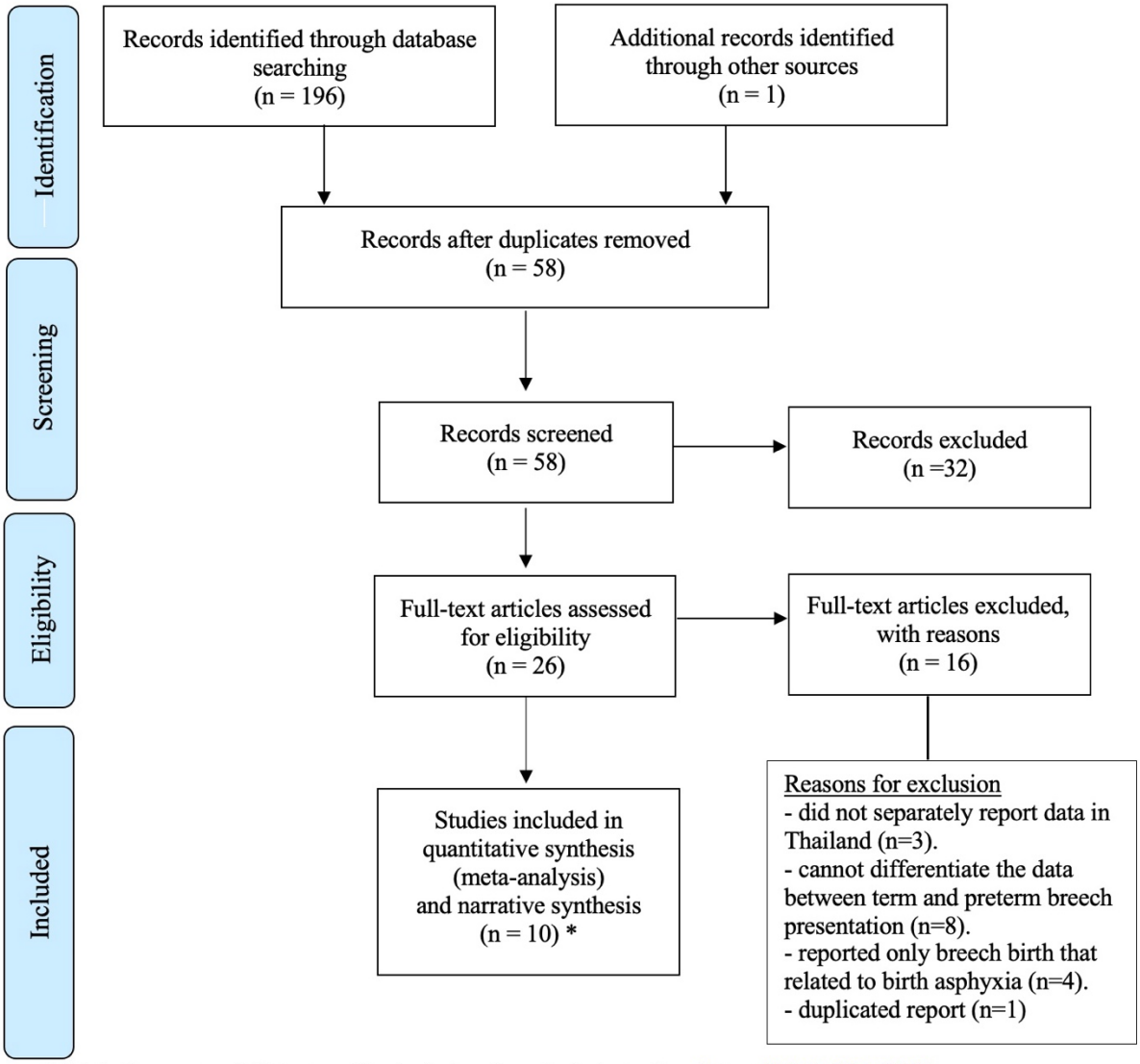

Figure 1. PRISMA flowchart for selection process
* Link for accessing full texts of included and excluded studies: https://bit.ly/2Eq9YJj

Table 2. Key features and findings of included studies (Cohort studies)

No.	Study	Design	Data collected year	Data conducted setting	Inclusion criteria	Exclusion criteria	Sample size (N)	Participant characteristics		TBP (n)	Mode of delivery of TBB						Funding support
								VBB group	CS group		VBB			CS			
											n (%)	Neonatal outcomes	Maternal outcomes	n (%)	Neonatal outcomes	Maternal outcomes	
1.	Wisestanakorn et al., 1990	Retrospective study	1983-1985	Ramathibodi Hospital	- Normal singleton breech presentation - Primipara - Frank breech - GA 37 wks. or more -Foetal weight of 2500g or more	Patient who failed vaginal breech deliveries	N = 263	- Maternal age (SD): 25.9 (2.9) years - GA(SD): 38.6 (1.9) weeks - Residents performed: 68 cases -Staff performed: 19 cases	- Maternal age (SD): 27.3 (4.4) years - GA(SD): 39.1 (0.9) weeks - Residents performed: 52 cases - Staff performed: 124 cases	n = 263	n = 87 (33.08%)	- Apgar score: - at 1 min < 7: 23/87 cases - at 5 min < 7: 3/87 cases - infant admitted intensive care unit for 37 days: 1 case **(A)** - No perinatal death	N/A	n = 176 (66.92%)	- Apgar score: at 1 min < 7 = 34/176 at 5 min < 7 = 3/176 - No newborn admission in NICU - No perinatal death	N/A	Ramathibodi research fund (1998)
2.	Wongwananuruk and Borriboonhirunsarn, 2005*	Retrospective study	2003	Siriraj Hospital	Singleton breech presentation with GA equal or more than 28 wks.	- Women were indicated for elective CS - Placenta previa - Previous CS - Dead foetus in utero	N = 317	- Mean maternal age 26.4 (5.7) years - GA: - ≥ 37 wks.: 32 cases - 33-36 wks.: 13 cases - 28-32 wks.: 11 cases - Parity: - 0: 13 cases - 1: 31 cases - >2: 12 cases - Maternalcomplication: 26 cases - Footling breech: 18 cases	- Mean maternal age 28.6 (6.1) years - GA: - ≥ 37 wks.: 218 cases - 33-36 wks.: 36 cases - 28-32 wks.: 7 cases - Parity: - 0: 175 cases - 1: 67 cases - >2: 19 cases - Maternal complication: 5 cases - Footling breech: 59 cases	n = 250	n = 32 (12.8%)	- Apgar score: -at 1 min < 7: 24 cases -at 5 min < 7: 5 cases - Neonatal jaundice: 10 cases - Others: 6 cases (not clearly defined) *- Prematurity: 11 cases*	Puerperal morbidity: 2 cases	n = 218 (87.2%)	-Apgar score: at 1 min < 7: 43 cases at 5 min < 7: 6 cases -Neonatal jaundice: 37 cases -Others: 46 cases (not clearly defined) **Prematurity: 6 cases*	- Puerperal morbidity: 8 cases	Not mention
3.	Pathanopas, 1994*	Retrospective study	1991-1993	Potharam Hospital	Singleton breech presentation pregnancy (not specify gestational age)	Twin breech presentation	N = 92	- GA: - < 37 wks.: 9 cases - ≥ 37 wks.: 26 cases - uncertain GA: 5 cases	- GA: - < 37 wks.: 5 cases - ≥ 37 wks.: 43 cases - Uncertain GA: 4 cases	n = 69	n = 26 (37.68%)	- Apgar score at 1 min: 5-7: 17 cases 3-4 : 1 cases 0-2 : 1 cases - Perinatal death 2 cases **(B)**	N/A	n = 43 (62.32%)	*Apgar score at 1 min: 5-7 : 7 cases 3-4 : 2 cases 0-2 : 0 cases *Perinatal death = 1 case **(C)**	N/A	Not mention
4.	Wattanaruangkowit, 2008*	Retrospective study	2007	Yasothon hospital	Singleton breech presentation at time of delivery and GA equal or more than 28 weeks	- Born before hospital arriving - CS indications: placenta previa, previous caesarean delivery, had foetal anomalies or dead foetus in utero	N = 71	- Mean maternal age 25.54 (1.50) years - GA; - ≥ 37 wks.: 4 cases - < 37 wks.: 7 cases - Parity: - 0: 2 cases - ≥ 1: 9 cases - Footling breech: 1 case - Maternal complication: 2 cases	- Mean maternal age 24.75 (3.51) years - GA; - ≥ 37 wks.: 38 cases - < 37 wks.: 22 cases - Parity; - 0: 39 cases - ≥ 1: 21 cases - Footling breech: 11 cases - Maternal complication: 4 cases	n = 42	n = 4/42 (9.52%)	- Apgar score; at 1 min < 7: 7 cases at 5 min < 7: 1 case - Neonatal death: 1 case **(D)**	- puerperal fever: 2 cases - blood transfusion: 0	n = 38/42 (90.48%)	- Apgar score; at 1 min < 7: 11 cases at 5 min < 7: 0 cases - Neonatal death: 0 case	- puerperal fever: 4 cases - blood transfusion: 4 cases	Not mention
5.	Limtiamratana,2007*	Retrospective study	2006	Banpong Hospital	Women with singleton breech presentation and GA equal or more than 28 weeks.	The women who had other CS indications: placenta previa, previous CS, foetal distress, foetal death intra uterine.	N = 213	- Mean maternal age (SD): 28.2 (7.06) years - GA: - ≥ 37 wks.: 65 cases - 33-36 wks.: 19 cases - 28-32 wks.: 3 cases - Parity. - 0: 25 cases - 1: 35 cases - ≥ 2: 27 cases - Footling breech: 15 cases - Maternal complication: 7 cases	- Mean maternal age (SD): 28.33 (6.38) years - GA: - ≥37 wks.: 120 cases - 33-36 wks.: 6 cases - 28-32 wks.: 0 cases - Parity; - 0: 87 cases - 1: 26 cases - ≥ 2: 13 cases - Footling breech: 13 cases - Maternal complication: 4 cases	n = 185	n = 65 (35.1%)	- Apgar score: at 1 min < 8: 19 cases at 5 min < 8: 2 cases - Neonatal jaundice 0 - Others (preterm, birth trauma, NICU admission): 30 cases - Perinatal death: 1 case (Preterm birth)	- Fever = 1 case - PPH = 0	n = 120 (64.9%)	- Apgar score: at 1 min < 8: 1 case at 5 min < 8: 1 case - Neonatal jaundice = 1 case - Others (preterm, birth trauma, NICU admission): 14 cases - Perinatal death: 0	- Fever 7 cases -PPH 3 cases	Not mention
6.	Chaipinitpan, 2005*	Retrospective study	2004-2005	Satun Hospital	Women with singleton breech presentation who	Women with others CS indications: placenta previa,	N = 221	- Mean maternal age (SD): 30 (4.7) years - GA:	- Mean maternal age (SD): 29 (3.9) years - GA:	n = 190	n = 30 (15.8%)	- Apgar score: - at 1 min < 7: 7 cases	- Blood transfusion: 37 cases	n = 160 (84.2 %)	- Apgar score: - at 1 min < 7: 9 cases	- Blood transfusion: 163 cases	Not mention

No.	Study	Design	Data collected year	Data conducted setting	Inclusion criteria	Exclusion criteria	Sample size (N)	Participant characteristics		TBP (n)	Mode of delivery of TBB						Funding support
								VBB group	CS group		VBB			CS			
											n (%)	Neonatal outcomes	Maternal outcomes	n (%)	Neonatal outcomes	Maternal outcomes	
					GA equal or more than 28 weeks at delivery time	previous CS, Intra-utero foetal death.		- ≥ 37 wks.: 30 cases - 33-36 wks.: 6 cases - 28-32 wks.: 2 cases - Parity; - 0: 8 cases - 1: 11 cases - ≥ 2: 19 cases - Footling breech: 7 cases -Maternal complication: 3 cases	- ≥ 37 wks.: 160 cases - 33-36 wks.: 11 cases - 28-32 wks.: 2 cases - Parity - 0: 72 cases - 1: 55 cases - ≥ 2: 46 cases - Footling breech: 34 cases - Maternal complication: 13 cases			- at 5 min < 7: 6 cases - Neonatal jaundice 29 cases - Birth trauma 3 cases - Admit NICU 4 cases - *Prematurity 10 cases*			- at 5 min < 7: 5 cases - Neonatal jaundice: 151 cases - Birth trauma 1 cases - Admit NICU 5 cases - *Prematurity = 8 cases*		
7.	Puangsricharern and Anakrat, 2012*	Retrospective study	2002-2008	Rajavithi Hospital	Women with singleton breech presentation who GA equal or more than 28 weeks at delivery time	Women who did not attend ANC, had foetal anomalies, previous caesarean delivery, death foetal in utero and infants with congenital anomalies e.g. anencephaly, chromosomal anomalies	N =1585	- Maternal mean age (SD): 27.04 (6.56) years - GA: - < 34 wks.: 89 cases - 34-36 wks.: 32 cases - > 36 wks.: 136 cases - Parity; - 0: 103 cases - ≥ 1: 154 cases - non-frank breech: 69 cases	- Maternal mean age (SD): 27.94 (6.02) years - GA: - < 34 wks.: 94 cases - 34-36 wks.: 109 cases - > 36 wks.: 1122 cases - Parity; - 0: 817 cases - ≥ 1: 511 cases - non-frank breech: 520 cases	n =1258	n = 136 (52.92%)	- Apgar score at 1 min; - 0-3: 61 cases - 4-7: 74 cases - Apgar score at 5 min; - 0-3: 2 cases - 4-7: 51 cases - Neonatal intubation 57 cases - NICU admission 58 cases - Neonatal death 20 cases	- PPH: 12 cases - Length of hospital stay; - 24-48: 80 cases - 49-72: 76 cases - 73-96: 35 cases - > 96: 32 cases	n = 1122 (84.68%) *before labour: 1070 cases *After labour 258 cases	- Apgar score at 1 min; - 0-3: 18 cases - 4-7: 185 cases - Apgar score at 5 min; - 0-3: 4 cases - 4-7: 31 cases - Neonatal intubation 36 cases - NICU admission 86 cases - Neonatal death 3 cases	- PPH: 87 cases - Length of hospital stay; - 24-48: 9 cases - 49-72: 49 cases - 73-96: 243 cases - > 96: 941 cases	Not mention

No.	Study	Design	Data collected year	Data conducted setting	Inclusion criteria	Exclusion criteria	Sample size (N)	Participant characteristics		TBP (n)	Mode of delivery of TBB						Funding support
								VBB group	CS group		VBB			CS			
											n (%)	Neonatal outcomes	Maternal outcomes	n (%)	Neonatal outcomes	Maternal outcomes	
8.	Anuwutnavin et al., 2019	Retrospective study	2007-2015	Siriraj hospital	Women with singleton breech presentation who underwent CS at GA 37 weeks or later	Foetal major/lethal congenital malformations, multifetal gestation, foetal growth restriction, foetal death in utero, failed attempt at vaginal breech delivery, presence of placenta previa and case with incomplete outcome data	N =2178	**EICS** - Maternal age; -< 35 years 591 cases -≥ 35 years 265 cases - Parity; - 0: 543 cases - ≥ 1: 313 cases - Previous uterine surgery 102 cases - Underlying disease 337 cases - Type of breech presentation; -Frank 283 cases -Complete 209 cases -Incomplete 91 cases - Operators; -Staff 421 cases -Residents/fellow 435 cases	**EmCS** - Maternal age; -< 35 years 1031 cases -≥ 35 years: 291 cases - Parity; -0: 697 cases -≥ 1: 625 cases - Previous uterine surgery 83 cases - Underlying disease 493 cases -Type of breech presentation; - Frank 520 cases - Complete 332 cases - Incomplete 136 cases - Operators; - Staff 276 cases - Residents/fellow 1046 cases	n =2178	**EICS**			**EmCS**			Siriraj research development fund, Faculty of medicince, Siriraj hospital
											n = 856 (39.3%)	-No birth trauma, neonatal seizure, perinatal death - Apgar at 1 min: -0-3; 3 cases -4-6; 49 cases -Apgar at 5 min: -0-3; 0 case -4-6; 2 cases -NICU admission: 3 cases -Duration of NICU admission: 26(4-36) days	- No case of uterine wound extension, pneumonia, urinary tract infection, thromboembolic events, readmission or maternal death. - composite maternal morbidity: 7 cases - postpartum haemorrhage: 7 cases - Estimated blood loss 1000(1000-1300) ml - maternal fever: 1 case - prolonged hospital stay: 0	n = 1322 (60.7%)	- No birth trauma, neonatal seizure, perinatal death - Apgar at 1 min: -0-3; 19 cases -4-6; 68 cases - Apgar at 5 min: - 0-3; 1 case - 4-6; 5 cases - NICU admission: 5 cases - Duration of NICU admission: 12(9-28) days	- No case of uterine wound extension, pneumonia, urinary tract infection, thromboembolic events, readmission or maternal death. - composite maternal morbidity: 10 cases - postpartum haemorrhage: 3 cases - Estimated blood loss 2500(1000-2500) ml. - maternal fever: 3 cases - wound infection or dehiscence: 2 cases - Endometritis: 3 cases - internal organ injury: 1 case - caesarean hysterectomy: 1 case - prolonged hospital stay: 7 cases	
9.	Chanrachakul et al., 1999	Prospective study	1998	Ramathibodi Hospital	Non-private patients with breech presentation equal or more than 36 weeks of gestation.	Women who were found the contraindications after performing ultrasound or cardiotocogram(CTG): compromised foetus, oligohydramnios, placenta previa, PROM, multiple gestation, uterine anomaly, unexplained uterine bleeding, previous vertical uterine incision.	N = 32 (2 women were transverse lie) ***Breech presentation N = 30***	**ECV procedure**			**ECV**						
											Successful ECV			**Unsuccessful ECV**			
								- Counselling risks-benefits, success rate of ECV. - Admitted as outpatient after fasting for 8 hours before procedure. - Performing the ECV at labour ward. - Ultrasound was performed for all patients to examine the contraindications and confirm breech presentation. - Cardiotocogram was performed before procedure. - The patients were given 2.5 mg of terbutaline intravenously as tocolysis for uterine relaxation to improve the outcome unless patients have contraindication for tocolysis. - ECV was attempted either forward roll and backward flip. - Cardiotocogram was repeated following ECV irrespective the outcome. If the result was normal, the patient was allowed to go home. - The patients were followed up by one of the authors until delivery.	N/A	n = 19 (63.33%)	- there were no maternal or foetal complications during or after versions. - 1 of the patients had spontaneous reversion after the procedure (5%). - 14 women delivered vaginal cephalic birth - 7 of 21 successful ECV were delivered by CS (2: non progression of labour, 5: foetal distress, including one reversion case)	n = 11 (34.4%)	- there were no maternal or foetal complications during or after versions. - no spontaneous version near term of the unsuccessful patients, all of them presented with breech presentation in labour. - 5 of unsuccessful versions delivered by breech assisting. - 6 of unsuccessful versions delivered by CS due to primigravida, no progression of labour and foetal distress. - There was one foetal birth asphyxia, Apgar score 2, 6 at 1 and 5 min respectively, following vaginal breech delivery.	Not mention

No.	Study	Design	Data collected year	Data conducted setting	Inclusion criteria	Exclusion criteria	Sample size (N)	Participant characteristics		TBP (n)	Mode of delivery of TBB						Funding support
								VBB group	CS group		VBB			CS			
											n (%)	Neonatal outcomes	Maternal outcomes	n (%)	Neonatal outcomes	Maternal outcomes	
10.	Ruangchainikom et al., 2008	Prospective study	1997 - 2006	Bhumibol Adulyadej Hospital	All parturient attending the obstetrics unit, having completed GA 36 wks. or more with singleton non-vertex foetus.	Exclusion criteria for ECV; 1. Previous uterine scar and uterine abnormality 2. Multiple pregnancies 3. Evidence of uteroplacental insufficiency 4. Significant third trimester bleeding 5. Suspected intrauterine growth restriction 6. Amniotic fluid abnormalities 7. Maternal cardiac disease 8. Uncontrolled hypertension 9. Non-reassuring foetal monitoring pattern	N = 140	Counselling and Consent obtained from all patients attempting ECV. - Physical examination (general status, weight, blood pressure, pulse rate, heart sound, lung field, abdominal scar and abdomen and uterus palpation). - Foetal heart rate tracing and uterine contraction were recorded. - A single dose of tocolysis was administered intravenously (Terbutaline/Bricanyl 0.3-0.5 mg) before ECV attempting. - ECV was performed under double set up condition, NPO 6 hrs, operation facilities were immediately available. - Assessing the exact position of foetus. - The operators gently displaced the breech from pelvic brim superiorly, applied simultaneous circular steady pressure on the head, neck and upper back of the foetus with one hand and the breech of foetus with the other hand in a forward somersault direction and backward somersault direction if the first attempt failed. - Foetal heart activity was monitored every one minute by real time ultrasound during the procedure. - Non-stress test was assessed after procedure. - Antenatal care, management of delivery did not differ from other pregnant womens.		N/A	n = 100 (71.43%)	- All of post intervention (ECV), non-stress test was reactive. - Non of all participants experienced adverse outcomes. - All successful cases presented in vertex presentation in labour. - 65 parturient with successful ECV delivered vaginally - 35 parturient in this group had caesarean section for various indications such as foetal distress, cephalopelvic disproportion, and failure to progress.		n = 40 (28.57%)	- All of post intervention (ECV), non-stress test was reactive. - Non of all participants experienced adverse outcomes. - Non of failed cases had spontaneous reversion. - 36 parturient in the failed ECV group had elective caesarean section. - 4 women underwent vaginal breech delivery.		Not mention

Noted

*Analysis of maternal and neonatal outcomes included preterm breech births

(A) Presented with subarachnoid hemorrhage, however this child was normal development in 2 years following.

(B) Stillbirth 2 cases (not mention term or preterm of perinatal mortality cases).

(C) Hydrops fetalis (not mention term or preterm of perinatal mortality cases.

(D) Preterm birth GA 34 wks. weight 1720g, admitted at labour room with fully cervical dilatation, delivered by breech assisting by an obstetrician, Apgar score at 1 and 5 min were 1 and 0 respectively, then it died)

Abbreviation:

GA: Gestational age
SD: Standard deviation
N/A: Not applicable
NICU: Neonatal intensive care unit
CS: Caesarean section
ElCS: Elective caesarean section
EmCS: Emergency caesarean section
VBB: Vaginal breech birth
PPH: Postpartum hemorrhage
Wks.: Weeks
ECV: External cephalic version
EFW: Estimated foetal weight
PROM: Premature rupture of membrane
TBP: Term breech presentation

Data synthesis

Percentage of term breech presentation and mode of delivery in Thailand

The prevalence of delivery in TBP amongst all deliveries was reported at 3.86% by only one study.[36] However, two included studies[38,39] indicated that the prevalence of breech presentations (term and preterm) among all deliveries in their study settings were 2.95% and 3.14% respectively. TBP represented 89.78% of all breech deliveries in eight studies (4435/4940). Mode of delivery of TBP in Thailand has favoured CS over VBB for decades. The overall VBB rate reported in seven included studies was 13.76% of all TBP (Table 3). The CS rate was consistently higher than VBB, ranging between 62.32% to 90.48% during the publication years 1990-2012, with an average rate of 86.24% for all TBP reported in the seven studies comparing VBB.

Table 3. The percentage of TBP and modes of delivery in Thailand across the included studies

No	First author & year	TBP(N)	Mode of delivery of TBB		
			VBB (N (%))	CS (N (%))	
				ElCS	EmCS
1	Wisestanakorn, 1990	263	87 (33.08)	176 (66.92)	
2	Wongwananuruk, 2005	250	32 (12.80)	218 (87.20)	
3	Pathanopas, 1994	69	26 (37.68)	43 (62.32)	
4	Wattanaruangkowit, 2008	42	4 (9.52)	38 (90.48)	
5	Limtiamratana, 2007	185	65 (35.14)	120 (64.86)	
6	Chaipinitpan, 2005	190	30 (15.79)	160 (84.21)	
7	Puangsricharern, 2012	1258	136 (10.81)	1122 (89.19)	
	Total	**2257**	**380 (13.76%)**	**1877 (86.24%)**	
8	Anuwutnavin, 2019	2178	N/A	856 (39.30)	1322 (60.70)
	Total	4435*	**380 (8.57%)**	**4055 (91.43%)**	

External cephalic version

The two prospective studies[36,44] reporting outcomes of ECV in Thailand were considered as small, with sample sizes of 32 and 140 women. Therefore, they cannot confirm the efficacy and safety of ECV for TBP in Thailand. Both studies were conducted in tertiary hospitals and recruited participants within the same gestational age (36 weeks). The contraindications and procedures for ECV were compatible between studies (Table 4).

The success rate was 63.33%[44] and 71.43%[36] of all attempts. The modes of delivery following successful ECV were more likely to be VD rather than CS, however both studies displayed similar rates, 66.67% and 65% of vaginal deliveries with 33.33% and 35% CS rates (Table 4). Spontaneous reversion only occurred in one fetus.[44] In unsuccessful ECV groups, CS outweighed VBB in both studies, with a significant difference (CS 90% versus VBB 10%).[36] Fetal and maternal complications occurring during and after the ECV procedure were absent in both studies. Only one case of birth asphyxia following VBB was reported.[44] The aggregated total of ECV success rate from two studies is high at 70% of all ECVs attempted (Table 4). The CS rate is significantly lower in the successful group compared to the failed group (34.71% versus 82.35%).

Table 4. Characteristics and findings of ECV studies included in the review

Study	Participant	ECV Procedure	Outcome		
			Successful	Unsuccess	Complication
Chanrachakul et al., 1999 N = 32 (breech presentation, n=30)	- Non-private patients with breech presentation - GA 36 weeks or more - Contraindications: 1. Compromised fetus 2. Oligohydramnios 3. Placenta previa 4. PROM 5. Multiple gestations 6. Uterine anomaly 7. Unexplained uterine bleeding 8. previous vertical uterine incision.	1. Counselling risks-benefits, success rate of ECV. 2. Fasting for 8 hours before procedure. 3. Ultrasound and cardiotocogram were performed before procedure. 4. ECV was conducted in labour ward. 5. Administrating 2.5 mg of terbutaline intravenously before ECV. 6. Forward roll and backward flip. 7. Cardiotocogram was repeated after procedure. 8. The patients were followed up by one of the authors until delivery.	- Rate 63.33% (19/30) of breech presentation - 1(5%) spontaneous reversion - 14* (66.67%) women delivered vaginal cephalic birth. - 7* (33.33%) were delivered by CS (2: non progression of labour, 5: fetal distress, including one reversion case).	- Rate 36.66% (11/30) of breech presentation - No spontaneous version - 5 (45.45%) delivered by VBB. - 6 (54.55%) delivered by CS due to primigravida, no progression of labour and fetal distress.	No maternal or fetal complications during or after ECV. There was one birth asphyxia, Apgar score 2, 6 at 1 and 5 min respectively, following vaginal breech delivery.
Rueangchainikhom et al., 2008 N = 140	- All parturient attending the obstetrics unit. - GA 36 weeks or more with singleton non-vertex fetus. - Contraindications: (exclusion criteria for ECV) 1. Previous uterine scar and uterine abnormality 2. Multiple pregnancies 3. Evidence of uteroplacental insufficiency 4. Significant third trimester bleeding 5. Suspected intrauterine growth restriction 6. Amniotic fluid abnormalities 7. Maternal cardiac disease 8. Uncontrolled hypertension 9. Non-reassuring fetal monitoring pattern	1. Counselling and consent obtained. 2. Physical examination 3. Fetal heart rate tracing and uterine contraction were recorded. 4. Double set up condition, NPO 6 hrs., operation facilities were immediately available. 5. A single dose of tocolysis was administered intravenously before ECV (Terbutaline/Bricanyl 0.3-0.5 mg) 6. Assessing the exact position of fetus and performed forward somersault direction and backward somersault direction if the first attempt failed. 7. Fetal heart activity was monitored every one minute by real time ultrasound during the procedure. 8. Non-stress test was assessed after procedure.	- Rate 71.43% (100/140) - No spontaneous reversion - 65 (65%) delivered vaginally. - 35 (35%) parturient had CS (fetal distress, cephalopelvic disproportion, failure to progress).	- Rate 28.57% (40/140) - No spontaneous reversion. - 36 (90%) parturient in the failed ECV group had ElCS. - 4 (10%) women underwent VBB.	- All of post ECV, non-stress test were reactive. - None of all participants experienced adverse outcomes.

Study	Participant	ECV Procedure	Outcome				
			Successful		Unsuccess		Complication
	Overal average		119/170 **(70%)**		51/170 **(30%)**		One birth asphyxia following vaginal breech delivery.
			VD	**CS**	**VBB**	**CS**	
			79/121 **(65.29%)**	42/121 **(34.71%)**	9/51 **(17.6%)**	42/51 **(82.35%)**	

Overall mode of delivery of women who attempted ECV : CS 48.84%; VD 65.29%; VBB 17.65%

** Included 2 cases of transverse lie in successful group*

Neonatal outcomes by mode of birth in breech presentation

Each of the eight studies reported neonatal outcomes, with seven comparing neonatal outcomes between VBB and CS (Figure 2). A study[37] examining ElCS versus EmCS in TBPs was excluded from the meta-analysis due to the difference in intervention and comparator. Therefore, this study was subsequently narratively described.

The meta-analysis of Apgar score at 1 minute of < 7 included 2752 singleton breech births. All individual studies showed the association of higher risk of 1-minute Apgar score of < 7 in the VBB group. The overall RR of the VBB group was 2.86-fold higher than the CS group and showed substantial heterogeneity (I^2 = 68%). VBB was also associated with increasing risk of 5 minute Apgar score < 7, when compared with CS (RR 6.01, 95%CI 3.11-11.63). Heterogeneity testing showed moderate variability (I^2 = 42%). Sensitivity analysis of Apgar scores at 1 and 5 minutes < 7 was performed to exclude studies that contained significant imbalance in prematurity between groups and a high proportion of prematurity. The results were 2.57 (95%CI 1.77-3.47) and RR 5.78 (95%CI 2.64-12.65) respectively.

The overall RR of birth trauma indicated that the VBB had a ten-fold higher risk than CS without heterogeneity across included studies (RR 10.44, 95%CI 1.67-65.12, I^2 = 0). However, the wide range of 95% CI illustrated the imprecision of the estimated effect. One study [43] provided the detail of one case of birth trauma in the VBB group which was due to subarachnoid hemorrhage, however this case normalised within 2 years. Meanwhile, the cause of the three cases of birth trauma was not explained. [42] VBB was associated with an increased risk of NICU admission compared to CS (RR 3.51, 95% CI 2.61-4.72), without variability across included studies (I^2 =0).

Overall neonatal deaths indicated increased risk in the VBB group when compared to the CS group (RR 12.35, 95%CI 3.14-48.56) (Figure 2), however imprecision of the estimated effect was presented based on the wide 95% CI. Sensitivity analysis was conducted with all included studies for neonatal mortality, and the overall RRs ranged between 4.77 to 24.94, which indicated inconsistency of synthesised results. However, different terminology reporting was found; some studies used the term “perinatal death” instead of “neonatal death”.[40,41] Thus, perinatal mortality subgroups were analysed with an overall RR of 3.12 (95%CI 0.47-20.82) with the AR difference at 1.8%. VBB was associated with a slightly lower risk of neonatal jaundice when compared to CS (RR 0.9, 95%CI 0.75-1.07), with an absence of heterogeneity across the included studies.

One study excluded from meta-analysis[37] discerned neonatal outcomes following the ElCS versus EmCS of TBP. When comparing the ElCS and EmCS

groups within this study, ElCS is associated with decreasing risk of Apgar scores at 1 and 5 minutes < 7 (RR 0.92, 95% CI 0.66-1.29 and RR 0.51, 95% CI 0.10-2.54 respectively). However, AR differences are small between the intervention groups (0.51% and 0.22%). The NICU admission is also slightly lower in the ElCS group when compared to EmCS (RR 0.92, 95% CI 0.22-3.86)

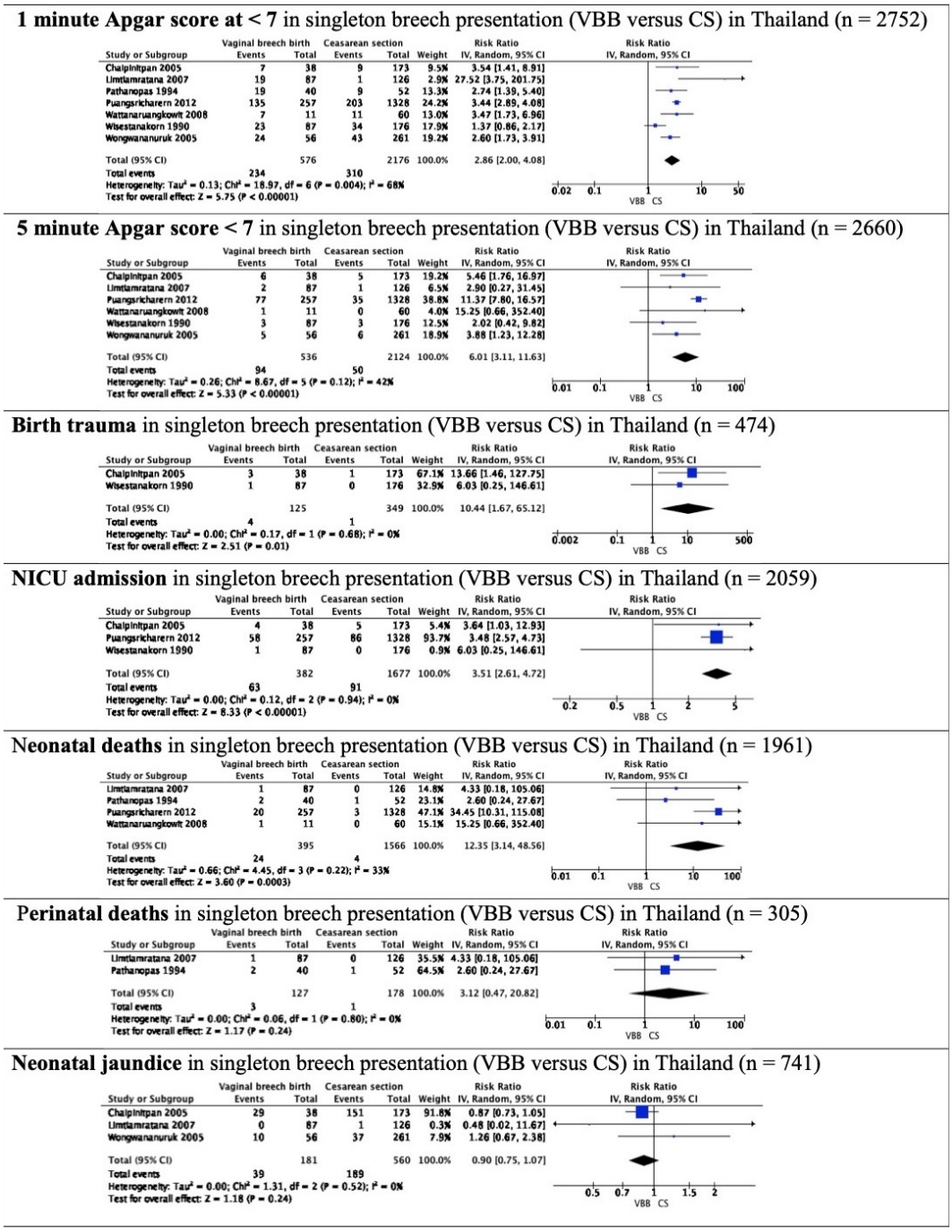

Figure 2. Meta-analysis of neonatal outcomes

Maternal outcomes

Five studies reported maternal outcomes comparing VBB and CS (Figure 3), and 1 study reported maternal complications of ElCS against EmCS. There were three maternal outcomes for which the findings could be synthesised through meta-analysis: puerperal fever, blood transfusion and postpartum haemorrhage.

The overall RR of puerperal fever indicated a slightly higher risk in CS than in VBB (RR 0.82, 95%CI 0.07-10.25). Postpartum haemorrhage was lower in the VBB group (RR 0.68, 95%CI 0.38-1.21) (Figure 15). Blood transfusion was associated with a slightly increased risk in VBB (RR 1.03, 95%CI 0.97-1.10). However, all differences were not statistically significant between the groups.

Among other maternal complications, puerperal morbidity was not statistically significantly different between the VBB and CS groups at 3.6% versus 3.1% respectively.[35] The length of hospital stay more than 72 hours was higher in the CS groups compared with VBB (89.15% versus 26.07%).[38]

Comparison of maternal outcomes between ElCS and EmCS showed that EmCS increased the risk of peripartum hysterectomy, internal organ injury, endometritis, wound infection or dehiscence and prolonged hospital stay, while these complications were absent in the ElCS group.[37] Among EmCS, fever was slightly higher (0.2% versus 0.1%), and estimated blood loss was higher (2500 ml versus 1000 ml).[37] However, composite maternal morbidity and postpartum haemorrhage were compatible between the groups.[37] All maternal outcomes reported in this study were not significantly statistically different between the groups.

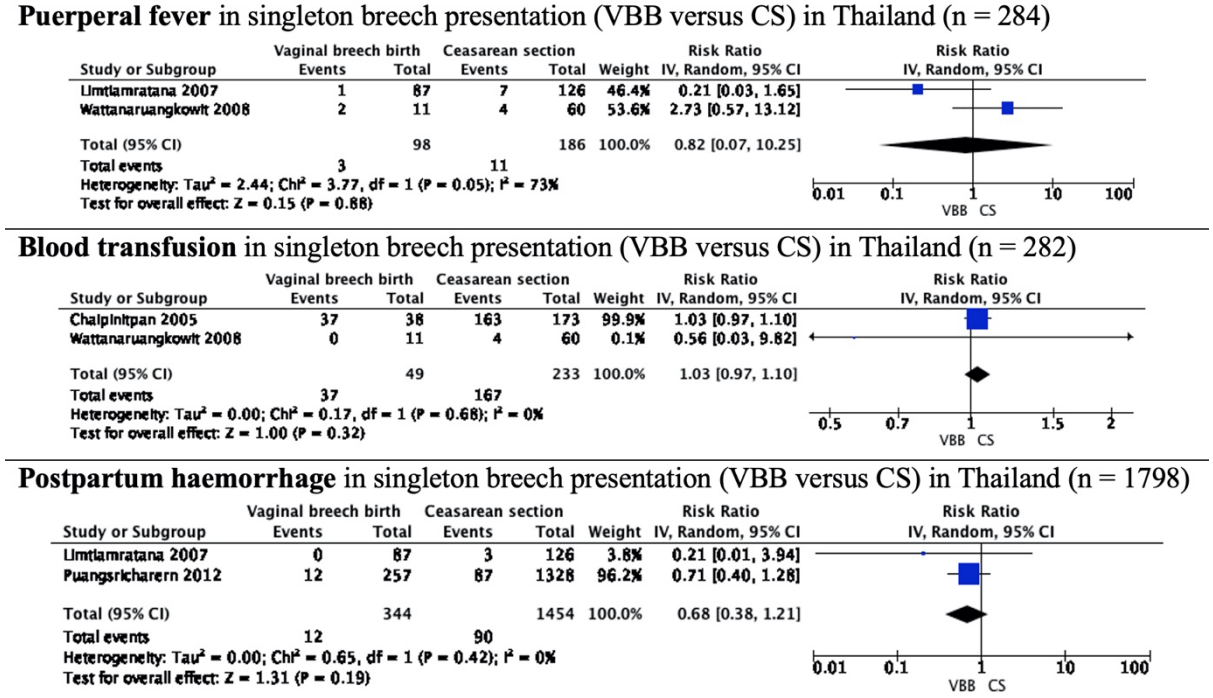

Figure 3. Meta-analysis of maternal outcomes

Risk of bias of individual studies and across studies

This review assessed the quality of included studies following the NICE methodology checklist for cohort studies. The potential biases of the included studies, in terms of selection bias, performance bias, attrition bias, and detection bias, seem to be high and unclear, which effected the low internal validity. However, the external validity of all studies is considered to be sound for a Thai population. Risk of biases is introduced through the nature of observational studies, especially the presence of confounding factors. Moreover, incomplete reporting of details of interventions implemented and outcomes measured leads to overall low validity of findings. When evaluating the risk of bias across individual studies, accumulation in biases is present within the three key outcomes of neonatal, maternal, and ECV. Therefore, caution should be applied when using the findings. The summary of the quality assessment of individual studies based on the outcomes can be found at https://bit.ly/33rZmG6.

The funnel plot (Figure 4), plotting the effect sizes against the study sizes, displayed an asymmetrical graph, which may refer to publication bias in this review.[45] Figure 4 illustrates the absence of the results of the small studies (lower space).

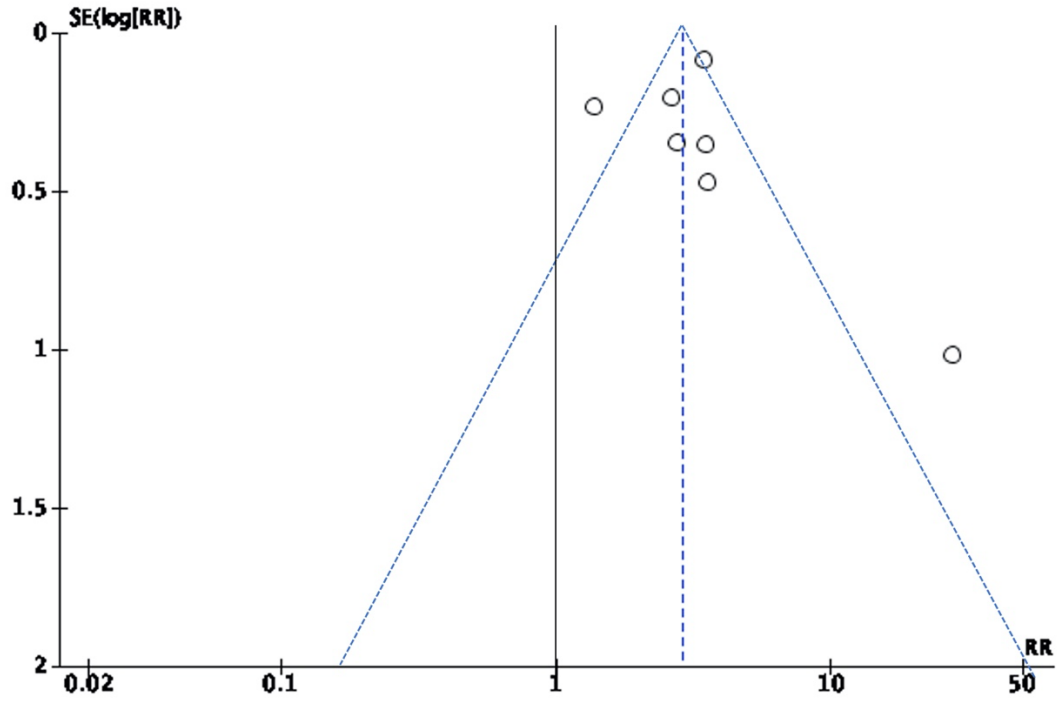

Figure 4. The funnel plot of seven studies included in the meta-analysis

DISCUSSION

Percentage of term breech presentation and mode of delivery

Within this SR, term breech presentation occurred in approximately 3%-4% of all pregnancies in Thailand; similar to the range of 3%-4% reported.[1] The VBB rate in this review is 13.76%, which is higher than a population-based study from California, which reported 4.6% of 100,667 breech births.[46] However, the SR by Berhan et al[16] demonstrated a higher

rate of planned VBB at 32.91% among all term breech deliveries. This could be caused by the studies originating from high-income countries, where VBB is still a reasonable option. In Thailand, management of the mode of delivery of TBPs has focused on CS, therefore significantly contributing to the increase in CS rate by at least approximately 2%-3%, according to the reports of the breech birth rates. Other reviews have indicated that breech presentation is a major contributor to the overall CS rate.[47] The influence of the TBT[7] on the trend of the mode of delivery in Thailand seemed to accelerate the overall CS rate and falling VBBs post publication. This is similar to the effects seen in many countries worldwide, such as the Netherlands and Germany, in which the CS rate in TBPs reached 80% and 90% respectively.[48,49]

External cephalic version

The average success rate of all attempted ECV in this review is 70%; however this is derived only from two small studies.[36,44] The success rate is high when compared to a pooled estimate of a 58% ECV success rate in another recent meta-analysis [50], or the report of large prospective observational studies in the Netherlands at 47% [51] and in the UK at 49%.[52] This might relate to the use of tocolysis in Thailand: an effective intervention to improve the ECV success rate, based on the meta-analysis.[53] Moreover, the small number of studies with positive results in this SR may refer to the presence of publication bias or selection bias if participant recruitment was related to ECV success predictors such as multiparity.[54] Only one reversion (0.6%) was reported amongst the successful cases, with no spontaneous reversions in the failed group. This was similar to the rare reversion, which occurred in only 2.2% of 2614 women with non-cephalic presentation at term underwent ECV.[52]

The rate of cephalic births after successful ECV in this SR was high compared to the report of a large series observational study (65.29% versus 47%)[55], which seems to be related to case selection, including more multiparous women. The CS rate in the failed ECV group is approximately 2.4 times higher than the CS rate in the successful ECV group. This is similar to the reduction of CS rate reported in the Cochrane review of ECV for breech presentation at term, comparing the ECV attempted versus those in which it was not attempted.[10] This standard of care can and should be implemented nationwide for improvement on a wider scale.

Although the size of the studies does not provide conclusive evidence of safety, the studies in this review demonstrated no adverse effects occurring during and after ECV and only one incidence of birth asphyxia following VBB was not associated with ECV procedure. This is similar to the low complication following ECV reported in large observational studies.[52] However, ECV is not a standard intervention in Thailand[56] routinely offered to all women with breech presenting who have no contraindications as per ACOG and RCOG recommendations.[57,58]

Neonatal outcomes

Short-term neonatal outcomes were synthesised using meta-analysis. The pooled estimates of the low Apgar score, birth trauma, NICU admission, neonatal death and subgroup analysis of perinatal mortality all show higher risks within the VBB groups, with only neonatal jaundice being lower. The ARs differences for all neonatal outcomes were as considerable as the RRs. This demonstrates the major differences in previous reviews synthesising only TBPs,[16,59] suggesting significant room for improvement in management approaches in Thailand.

The smallest AR differences in perinatal mortality outcomes in this SR indicate 1.8%, or 18/1000. This is still

substantially higher than that reported in the SR of Berhan and Haileamlak[16], in which the AR of perinatal death was 0.3%, or 3/1000. In Thailand, VBB is currently associated with a higher rate of neonatal deaths, 12.35 times more than the CS group, with a considerable AR difference of 6%. However, there are some substantial confounders to consider, such as prematurity; for example, the only one infant who died in the VBB group was premature.[41] Moreover, Pathanopas[40] reported causes of death in which two stillbirths and one hydrops fetalis death occurred in the VBB and CS groups respectively. As the causes of death were clarified, they seem less likely to be associated with the mode of delivery. Compared with the result of TBT[7], which indicated AR of perinatal mortality at 1.3%, or 13/1000 in the planned VBB group, the perinatal mortality rate following VBB in Thailand remains higher. These findings suggest that VBB is probably not safe in Thailand unless better training can be provided to bring results into the range given by the large SR.[16] Currently, CS for breech presentation is safer in these Thai studies. However, with over 1:10 breech-presenting infants still being born vaginally, there is an urgent need to implement training to improve outcomes.

Similarly, the low Apgar score at 1 and 5 minutes, birth trauma, and higher risk of NICU admission and intubation of the VBB group in this review may be related to the risk associated with a trial of VBB, such as umbilical cord compression, fetal hypoxia and trauma, prolonged second stage of labour, hyperextension of fetal neck, incomplete breech presentation and lack of clinician's experiences.[60] Additionally, prematurity occurred most often among VBBs compared to the CS groups in almost all studies synthesised. Moreover, no included studies refer to selection criteria used for VBB, which may enhance perinatal outcomes.[21,58,61]

Maternal outcomes

Maternal outcomes synthesised in this review included puerperal fever, blood transfusion and postpartum haemorrhage. Meta-analysis indicated women are at a slightly lower risk following VBB compared to CS. However, the results did not reach a statistical significance in the different effect estimates between the groups. Likewise, the maternal morbidity results of TBT[7] showed no significant difference between planned CS and VBB. Moreover, secondary analysis of the PREMODA study[62] indicated that short-term composite severe maternal morbidity risks did not differ among planned CS and planned VBB of breech deliveries at term. However, a population based retrospective cohort study indicated a higher rate of puerperal fever and pelvic infection in ElCS compared to VBB (1.5% versus 0.5% respectively).[63] Incidence of hospital stays longer than 72 hours was significantly higher in the CS groups compared with VBB.

Certainty of the body of evidence

This review applied the GRADE approach to rate the quality of evidence for the association of mode of breech delivery and neonatal and maternal outcomes, and ECV outcomes. The available studies included in this SR are limited and weakened by methodological flaws associated with observational studies, leading to risks of bias and imprecision. High-quality evidence for further SRs regarding TBP in Thailand requires well-designed research to directly address the review questions.

Strengths and limitations of this review

Strengths

The strength of this SR is that it fulfilled all items within the PRISMA

checklist except protocol registration, in order to ensure the quality of SR and meta-analyses reporting[28]. Moreover, studies published in English and Thai were considered for inclusion, by contacting the journals publishing the studies that require full text for eligibility consideration if they were not available on the databases. This subsequently minimises publication bias. Although the review protocol was not registered, this study ensured the transparent and systematic conduct of the review based on the methodology of SR and meta-analyses.[26,32,64] Additionally, data synthesis was implemented following systematic methods of narrative synthesis[65] and meta-analysis.[66]

LIMITATIONS

Research into TBP in Thailand in relation to the mode of deliveries and neonatal and maternal outcomes has been limited. High-quality RCTs have not been published in Thailand. Therefore, this review solely included observational studies which contain a lower hierarchy of evidence than RCTs [29] and are prone to a high risk of bias. Observational studies display the association relationship of the estimated effect, unlike causation in RCT design [32] which can be biased by potential confounding factors. The methodology quality of included studies, especially due to selection bias inherent in non-randomized allocation, was considered high and unclear. This can affect the results of meta-analysis, undermined by cumulative bias. A considerable issue was that neonatal outcome analysis did not differentiate prematurity, which might reduce the reliability of the review results and generalizability of the findings for only the population of term breech infants.

RECOMMENDATIONS AND IMPLICATIONS

Policy

Term breech presentation contributes to an increased overall CS rate and consequent maternal morbidity; therefore a strategy for CS reduction should be considered in this population. ECV is a successful intervention to reduce CS for breech presentation at term. A national policy in Thailand should include ECV as standard practices for TBP. Revision of knowledge and skills related to vaginal breech birth for healthcare professionals are also required in order to optimize maternal and neonatal outcomes. Policymakers should reconsider current term breech approaches. Standardization of practices and skills throughout Thailand and a national guideline for term breech management would likely to contribute to improvement in outcomes for mothers and newborns.

Practice

The small amount of available evidence suggests that ECV is a successful intervention to reduce CS for breech presentation at term, with rare complications in Thailand. Adverse neonatal outcomes following VBB group are substantially higher than following CS, and this perhaps indicates that CS is still a safer mode of birth for TBPs in Thailand. However, the neonatal and maternal outcomes do not meet the quality evidence (GRADE) required to make a specific recommendation with regard to the mode of delivery for TBP. Because 1:10 breech presenting babies are still vaginally born, there is an urgent need for professional skills training and practice improvement, aligning with international practice guidelines. Moreover, within the studies ECV and VBBs were solely provided by obstetricians. Internationally, specialist midwives have a role in providing effective ECV and VBB, such as in the UK and the

Netherlands, where breech presentation research and practices are multi-disciplinary, allowing trained midwives to perform ECV[55] and term breech deliveries. Upskilling Thai midwives' roles from that of an assistant to a skilled breech practitioner may present an opportunity to reinvigorate TBP management in Thailand, providing more cost-effective services, and optimizing maternal and neonatal outcomes. Specialist clinics and intrapartum multi-disciplinary breech teams offer a way forward to improve practice.[67]

Research

The availability of qualitative and quantitative breech research in Thailand is very limited. Therefore, future breech research is necessary to inform the revision of practices, set up national guidelines and fill the existing gaps in this SR. The reporting of the prevalence of TBP through multicenter or national databases is required to develop strategies for designing care services for women with breech presentation at term. Future research on this topic needs to include only women with breech presentation at term and comparison between VBB and ElCS. This will help to address the controversy about whether planned CS or improvement in vaginal breech skills offer the best opportunities to improve neonatal outcomes in Thailand. A well-designed research strategy, minimising the risk of biases, such as RCTs, would be helpful for examining the effectiveness of VBD and ElCS in terms of maternal and neonatal outcomes. ECV research requires a larger sample size with a well-designed study for assessing success rates and complications of the intervention. Cost-effectiveness of ECV compared to CS can also be examined in order to support the proposed strategy's worthiness.

Education

ECV and VBB skills and experiences of healthcare professionals lack focus in Thai settings. The very small studies of ECV and low VBB rate in this SR might give some indication of the unavailability of skilled staff. Teaching and skills training programmes, concerning both knowledge and skills of term breech management, should occur alongside the future research in Thailand. Re-implementation of skills requires workshops or simulation training, and may benefit from a revision of midwife competencies relating to term breech management. Additionally, standards of competence to attend planned vaginal breech births should be trained as "a normal skill rather than an emergency" with a further breech specialist team to readily support TBBs in maternity care settings.[68]

CONCLUSIONS

The current SR of term breech management and outcomes in Thailand demonstrated a high success rate and rare complications of ECV with the effect of reducing CS. This points to potential benefits from a national policy of implementing ECV, through a reduction of the CS rate, avoiding further maternal risks and CS-related costs. However, the low certainty of evidence requires improved research design to confirm this effectiveness. Controversies about the mode of birth and neonatal outcomes are still problematic, where existing evidence is of very low quality and therefore unable to introduce specific recommendations to guide decision making. However, the evidence of this SR strongly supports the need for VBB skills training and practice improvement to optimise neonatal outcomes. Maternal outcomes that are modestly lowering risk in VBB groups also demonstrate the low certainty of evidence,

therefore judgment of the safest mode of birth for mothers with maternal long-term consequences, including subsequent pregnancies, needs more rigorous study. Substantial implications for healthcare professionals and maternity care policymakers are essential to reconsider current term breech approaches with standardization of practices and skills throughout Thailand. The research gaps identified are valuable for scaling up the quality and quantity of breech research improvement in Thailand, in line with systematically synthesised evidence initiating the plan for establishing national practical guidelines on term breech management.

REFERENCES

1. Cunningham FG, Leveno KJ, Bloom SL, Dashe JS, Hoffman BL, Casey BM, et al, editors.Williams Obstetrics. 25th ed. New York: Mc Graw Hill Education; 2018.
2. Kish K, Collea JV. Malpresentation and cord prolapse. In: DeCherney AH, Nathan L, editors. Current obstetric and gynecologic diagnosis and treatment. New York: McGraw- Hill Professional; 2002.
3. Håheim LL, Albrechtsen S, Berge LN, Børdahl PE, Egeland T, Henriksen T, et al. Breech birth at term: vaginal delivery or elective cesarean section? A systematic review of the literature by a Norwegian review team. Acta Obstet Gynecol Scand. 2004;83(2):126-30.
4. Mishra M, Sinha P. Does caesarean section provide the best outcome for mother and baby in breech presentation? A perspective from the developing world. J Obstet Gynaecol. 2011;31(6):495-8. doi: 10.3109/01443615.2011.578226
5. Lawson GW. The term breech trial ten years on: primum non nocere? Birth. 2012;39(1):3-9.
6. Hofmeyr GJ, Hannah M, Lawrie TA. Planned caesarean section for term breech delivery. Cochrane Database Syst Rev. 2015;2015(7):Cd000166.
7. Hannah ME, Hannah WJ, Hewson SA, Hodnett ED, Saigal S, Willan AR. Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomised multicentre trial. Term Breech Trial Collaborative Group. Lancet. 2000; 356(9239):1375-83.
8. Whyte H, Hannah ME, Saigal S, Hannah WJ, Hewson S, Amankwah K, et al. Outcomes of children at 2 years after planned cesarean birth versus planned vaginal birth for breech presentation at term: the International Randomized Term Breech Trial. Am J Obstet Gynecol. 2004;191(3):864-71. doi: 10.1016/j.ajog.2004.06.056.
9. Hutton EK, Hofmeyr GJ, Dowswell T. External cephalic version for breech presentation before term. Cochrane Database Syst Rev. 2015;2015(7): Cd000084. doi: 10.1002/14651858.CD000084.pub3.
10. Hofmeyr GJ, Kulier R, West HM. External cephalic version for breech presentation at term. Cochrane Database Syst Rev. 2015;2015(4): Cd000083. doi: 10.1002/14651858.CD000083.pub3.
11. Collaris RJ, Oei SG. External cephalic version: a safe procedure? A systematic review of version-related risks. Acta Obstet Gynecol Scand. 2004;83(6):511-8. doi: 10.1111/j.0001-6349.2004.00347.x.
12. Boucher M, Bujold E, Marquette GP, Vezina Y. The relationship between amniotic fluid index and successful external cephalic version: a 14-year experience. Am J Obstet Gynecol. 2003;189(3):751-4. doi: 10.1067/s0002-9378(03)00846-9
13. Impey L, Lissoni D. Outcome of external cephalic version after 36 weeks' gestation without tocolysis. J

Matern Fetal Med. 1999;8(5):203-7. doi: 10.1002/(SICI)1520-6661(199909/10)8:5<203::AID-MFM1>3.0.CO;2-Y.
14. Impey L, Pandit M. Tocolysis for repeat external cephalic version in breech presentation at term: a randomised, double-blinded, placebo-controlled trial. BJOG. 2005;112(5):627-31. doi: 10.1111/j.1471-0528.2004.00518.x
15. American College of Obstetricians and Gynecologists. ACOG Committee Opinion Number 745: Mode of term sigleton breech delivery. Obstetric & Gynecology. 2018; 132(2),e60–e63.
16. Berhan Y, Haileamlak A. The risks of planned vaginal breech delivery versus planned caesarean section for term breech birth: a meta-analysis including observational studies. BJOG. 2016;123(1):49-57. doi: 10.1111/1471-0528.13524
17. Goffinet F, Carayol M, Foidart JM, Alexander S, Uzan S, Subtil D, et al. Is planned vaginal delivery for breech presentation at term still an option? Results of an observational prospective survey in France and Belgium. Am J Obstet Gynecol. 2006;194(4):1002-11. doi: 10.1016/j.ajog.2005.10.817.
18. Kumari AS, Grundsell H. Mode of delivery for breech presentation in grandmultiparous women. Int J Gynaecol Obstet. 2004;85(3):234-9. doi: 10.1016/j.ijgo.2003.11.017
19. Habib S, Riaz S, Abbasi N, Ayaz A, Bibi A, Parveen Z. Vaginal breech delivery: still a safe option. J Ayub Med Coll Abbottabad. 2013;25(3-4):38-40.
20. Dohbit JS, Foumane P, Tochie JN, Mamoudou F, Temgoua MN, Tankeu R, et al. Maternal and neonatal outcomes of vaginal breech delivery for singleton term pregnancies in a carefully selected Cameroonian population: a cohort study. BMJ Open. 2017;7(11):e017198.
21. Society of Obstetricians and Gynaecologists of Canada. SOGC Clinical practice guideline: Vaginal Delivery of Breech Presentation. J Obstet Gynaecol Can. 2009;226(6): 557–66.
22. Fonseca A, Silva R, Rato I, Neves AR, Peixoto C, Ferraz Z, et al. Breech Presentation: Vaginal Versus Cesarean Delivery, Which Intervention Leads to the Best Outcomes? Acta Med Port. 2017;30(6):479-84. doi: 10.20344/amp.7920
23. Vlemmix F, Bergenhenegouwen L, Schaaf JM, Ensing S, Rosman AN, Ravelli AC, et al. Term breech deliveries in the Netherlands: did the increased cesarean rate affect neonatal outcome? A population-based cohort study. Acta Obstet Gynecol Scand. 2014;93(9):888-96. doi: 10.1111/aogs.12449
24. Hofmeyr GJ, Haws RA, Bergström S, Lee AC, Okong P, Darmstadt GL, et al. Obstetric care in low-resource settings: what, who, and how to overcome challenges to scale up? Int J Gynaecol Obstet. 2009;107 Suppl 1:S21-44, s-5. doi: 10.1016/j.ijgo.2009.07.017
25. Reeves BC, Deeks JJ, Higgins JP, Shea B, Tugwell P, Wells GA, et al. Including non-randomized studies on intervention effects. Cochrane Handbook for Systematic Reviews of Interventions; 2019. p. 595-620.
26. Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, et al (editors). Cochrane Handbook for Systematic Reviews of Interventions version 6.2. Cochrane [internet]. 2021 [updated 2021 Feb; cited 2021 Apr 25). Available from: www.training.cochrane.org/handbook.
27. McKenzie JE, Brennan SE, Ryan RE, Thomson HJ, Johnston RV. Summarizing study characteristics and preparing for synthesis. Cochrane

Handbook for Systematic Reviews of Interventions; 2019. p. 229-40.
28. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Bmj. 2021; 372:n71.
29. Greenhalgh T. How to read a paper: the basics of evidence-based medicine. 5th ed. London: John Wiley & Sons; 2014.
30. National Institute for Health and Care Excellence. The Social Care Guidance Manual. The Social Care Guidance Manual. NICE [Internet]. 2018 [cited 2021 Apr 25]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27905705.
31. Guyatt G, Oxman AD, Akl EA, Kunz R, Vist G, Brozek J, et al. GRADE guidelines: 1. Introduction-GRADE evidence profiles and summary of findings tables. J Clin Epidemiol. 2011;64(4):383-94. doi: 10.1016/j.jclinepi.2010.04.026
32. Dekkers OM, Vandenbroucke JP, Cevallos M, Renehan AG, Altman DG, Egger M. COSMOS-E: Guidance on conducting systematic reviews and meta-analyses of observational studies of etiology. PLOS Med. 2019;16(2):e1002742. doi: 10.1371/journal.pmed.1002742
33. Cochrane RevMan. Review Manager. Cochrane. [Internet]. 2020. [cited 2020 Jul 25]. Available from https://training.cochrane.org/online-learning/core-software-cochrane-reviews/revman.
34. Vergnes JN, Marchal-Sixou C, Nabet C, Maret D, Hamel O. Ethics in systematic reviews. J Med Ethics. 2010;36(12):771-4. doi: 10.1136/jme.2010.039941
35. Wongwananuruk T, Borriboonhirunsarn D. Incidence of vaginal breech delivery in singleton in Siriraj Hospital. J Med Assoc Thai. 2005;88(5):582-7.
36. Rueangchainikhom W, Sarapak S, Prommas S. Efficacy of external cephalic version with tocolysis in late pregnancy. J Med Assoc Thai. 2008;91(1):19-24.
37. Anuwutnavin S, Kitnithee B, Chanprapaph P, Heamar S, Rongdech P. Comparison of maternal and perinatal morbidity between elective and emergency caesarean section in singleton-term breech presentation. J Obstet Gynaecol. 2020;40(4):500-6. doi: 10.1080/01443615.2019.1634018
38. Puangsricharern A, Anakrat W. Trends in Singleton Breech Delivery in Rajavithi Hospital from 2002-2008. TJOG. 2012;20(10):191–7.
39. Wattanaruangkowit W. Singleton Breech Deliveries at Yasothon Hospital: A Retrospective Study. Health Sci. 2008; 17(6), SVI1622-8.
40. Pathanopas S. Breech delivery in Potharam Hospital. Region 7 Medical Journal. 1994; 13(2):95–103.
41. Limtiamratana S. Incidence of vaginal breech delivery in singleton in Banpong Hospital. Region 6 -7 Medical Journal. 2007;26(3):261–9.
42. Chaipinitpan S. Incidence and factors associated with vaginal breech delivery of sigleton breech presentation at Satun Hospital. Academic Journal 12. 2005;16(4.2):87-94.
43. Wisestanakorn W, Herabutya Y, P OP, Thanantaseth C. Fetal outcome in term frank breech primipara delivered vaginally and by elective cesarean section. J Med Assoc Thai. 1990;73 Suppl 1:47-51.
44. Chanrachakul B, Jaovisidha A, Herabutya Y, Srimanoi M, Puttharuksa J. External cephalic version: first report from Thailand. J Med Assoc Thai. 1999;82(3):224-8.
45. Sterne JA, Sutton AJ, Ioannidis JP, Terrin N, Jones DR, Lau J, et al. Recommendations for examining and interpreting funnel plot asymmetry in

meta-analyses of randomised controlled trials. BMJ. 2011;343:d4002.
46. Gilbert WM, Hicks SM, Boe NM, Danielsen B. Vaginal versus cesarean delivery for breech presentation in California: a population-based study. Obstet Gynecol. 2003;102(5 Pt 1):911-7. doi: 10.1016/s0029-7844(03)00809-3
47. Allen VM, Baskett TF, O'Connell CM. Contribution of select maternal groups to temporal trends in rates of caesarean section. J Obstet Gynaecol Can. 2010;32(7):633-41. doi: 10.1016/s1701-2163(16)34566-2
48. Molkenboer JF, Bouckaert PX, Roumen FJ. Recent trends in breech delivery in the Netherlands. BJOG. 2003;110(10):948-51.
49. Vidaeff AC. Breech delivery before and after the term breech trial. Clin Obstet Gynecol. 2006;49(1):198-210. doi: 10.1097/01.grf.0000197545.64937.40
50. Grootscholten K, Kok M, Oei SG, Mol BW, van der Post JA. External cephalic version-related risks: a meta-analysis. Obstet Gynecol. 2008;112(5):1143-51.
51. Beuckens A, Rijnders M, Verburgt-Doeleman GH, Rijninks-van Driel GC, Thorpe J, Hutton EK. An observational study of the success and complications of 2546 external cephalic versions in low-risk pregnant women performed by trained midwives. BJOG. 2016;123(3): 415-23. doi: 10.1111/ 1471-0528.13234
52. Melo P, Georgiou EX, Hedditch A, Ellaway P, Impey L. External cephalic version at term: a cohort study of 18 years' experience. BJOG. 2019;126(4):493-9. doi: 10.1111/1471-0528.15475
53. Cluver C, Gyte GM, Sinclair M, Dowswell T, Hofmeyr GJ. Interventions for helping to turn term breech babies to head first presentation when using external cephalic version. Cochrane Database Syst Rev. 2015. doi: doi.org/10.1002/14651858.CD000184.pub4
54. Kok M, Cnossen J, Gravendeel L, van der Post J, Opmeer B, Mol BW. Clinical factors to predict the outcome of external cephalic version: a metaanalysis. Am J Obstet Gynecol. 2008;199(6):630.e1-7; discussion e1-5. doi: 10.1016/j.ajog.2008.03.008
55. Beuckens A, Rijnders M, Verburgt-Doeleman GH, Rijninks-van Driel GC, Thorpe J, Hutton EK. An observational study of the success and complications of 2546 external cephalic versions in low-risk pregnant women performed by trained midwives. Bjog. 2016; 123(3):415-23. doi: 10.1111/1471-0528.13234
56. Chanrachakul B, Herabutya Y. The Practice of External Cephalic Version (ECV) and Vaginal Birth after Cesarean Section (VBAC) to reduce Cesarean Section rate in Thailand. TJOG. 2001;13(1):15–8.
57. American College of Obstetricians and Gynecologists. ACOG practice bulletin Number 221: External cephalic version. Obstetric & Gynecology. 2020;135(5):e203–12.
58. Royal College of Obstetricians and Gynecologists. External Cephalic Version and Reducing the Incidence of Term Breech Presentation. BJOG. 2017;124:e178–92.
59. Cheng M, Hannah M. Breech delivery at term: a critical review of the literature. Obstet Gynecol. 1993;82(4 Pt 1):605-18.
60. Yamamura Y, Ramin KD, Ramin SM. Trial of vaginal breech delivery: current role. Clin Obstet Gynecol. 2007;50(2):526-36. doi: 10.1097/GRF.0b013e31804c9d24
61. Royal Australian and New Zealand College of Obstetricians and Gynaecologists. Management of breech presentation at term. The Royal Australian and New Zealand College of

Obstetricians and Gynaecologists; 2016. p.1-13.
62. Korb D, Schmitz T, Alexander S, Subtil D, Verspyck E, Deneux-Tharaux C, et al. Association between planned mode of delivery and severe maternal morbidity in women with breech presentations: A secondary analysis of the PREMODA prospective general population study. J Gynecol Obstet Hum Reprod. 2020;49(2):101662. doi: 10.1016/j.jogoh.2019.101662
63. Krebs L, Langhoff-Roos J. Elective cesarean delivery for term breech. Obstet Gynecol. 2003;101(4):690-6. doi: 10.1016/s0029-7844(02)03073-9
64. Moola S, Munn Z, Tufanaru C, Aromataris E, Sears K, Sfetcu R, et al. Chapter 7: Systematic reviews of etiology and risk. In: Aromataris E, Munn Z (Editors). JBI Manual for Evidence Synthesis JBI; 2020.
65. Popay J, Roberts H, Sowden A, Petticrew M, Arai L, Rodgers M, et al. Narrative Synthesis in Systematic Reviews: A Product from the ESRC Methods Programme. ESRC Methods Programme. 2016;93.
66. Deeks JJ, Higgins JP, Altman DG, Group obotCSM. Analysing data and undertaking meta-analyses. Cochrane Handbook for Systematic Reviews of Interventions 2019. p. 241-84.
67. Derisbourg S, Costa E, De Luca L, Amirgholami S, Bogne Kamdem V, Vercoutere A, et al. Impact of implementation of a breech clinic in a tertiary hospital. BMC Pregnancy Childbirth. 2020;20(1):435. doi: 10.1186/s12884-020-03122-4
68. Walker S, Scamell M, Parker P. Standards for maternity care professionals attending planned upright breech births: A Delphi study. Midwifery. 2016;34:7-14. doi: 10.1016/j.midw.2016.01.007