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Pregnancies with a low-lying placenta - clinical benefits and risks of intended vaginal birth versus intended caesarean section

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Pregnancies with a low-lying placenta – clinical benefits and risks of intended vaginal birth versus intended caesarean section [Graviditet med lågt sittande placenta - nytta och risker av planerad vaginal födsel jämfört med planerat kejsarsnitt]

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1 Abstract

Background: A low-lying placenta is defined as a placental edge within two cm of the internal cervical os without covering it. This condition is associated with an increased risk of severe haemorrhage during and after pregnancy, as well as an increased risk of preterm birth and emergency caesarean sections. At term (≥37 weeks of gestation), low-lying placenta affects fewer than 0.3% of births in Sweden (the exact prevalence is unknown, as no specific diagnostic code for low-lying placenta is used). Currently, most women with a low-lying placenta undergo planned caesarean sections. However, it has been suggested that increasing the rate of vaginal birth, where appropriate, could reduce the risk of short- and long-term complications associated with surgery and the risk of placental complications in subsequent pregnancies.

Question at issue: Does management of singleton term (≥ 37 weeks +0 days) pregnancies with a low-lying placenta with an intended vaginal birth have clinical benefits and risks for the mother and infant compared with management with an intended caesarean section?

Methods: In January 2026, two authors performed literature searches in MEDLINE, Embase, and the Cochrane Library. They independently assessed identified abstracts and, by consensus, selected full-text articles to be considered by the other authors, who then decided by consensus whether the inclusion criteria were fulfilled. Included studies were critically appraised, and data were extracted. The certainty of evidence was assessed according to GRADE.

Results: Three non-randomised controlled studies with a total of 131 pregnancies with a low-lying placenta were included. All studies had major risk of bias, major limitations in precision, and some limitations of directness. Thus, the certainty of evidence was very low for all reported outcomes. Of the pregnancies managed with intended vaginal birth, 79% (95% CI 70% to 87%) resulted in vaginal birth. A significantly higher proportion of postpartum haemorrhage over 1000 mL was reported in the group with an intended caesarean section in two studies. No cases of maternal mortality, need for intensive care, or emergency interventions due to postpartum haemorrhage, neonatal or perinatal mortality, Apgar score <4 at 5 minutes, or abnormal umbilical cord arterial pH were reported in any of the studies. No study assessed the maternal outcomes breastfeeding at discharge, length of hospital stay, childbirth experience, or the child outcomes neonatal intensive care unit stay, therapeutic hypothermia, or long-term child outcomes. Two studies noted several pregnancies where the condition of low-lying placenta according to ultrasound reassessments beyond week 32 to 36 resolved antenatally.

Conclusion: It has been reported that vaginal birth is possible in carefully selected pregnant women. However, given the limited scientific evidence, no firm conclusions regarding the benefits and risks of management with intended vaginal birth compared with intended caesarean section can be drawn. The sparse evidence also limits the generalised consideration of ethical aspects and cost effectiveness.

2 Populärvetenskaplig sammanfattning – Plain language summary in Swedish

Bakgrund: Lågt sittande moderkaka är ett ovanligt tillstånd där moderkakan mot slutet av graviditeten ligger mycket nära livmoderhalskanalen (inom 20 mm från inre modermunnen). Tillståndet är förknippat med en ökad risk för allvarliga blödningar under och efter graviditeten, samt en ökad risk för förtidsbörd och akut kejsarsnitt. För närvarande föder de flesta gravida kvinnor med lågt sittande moderkaka med planerat kejsarsnitt, men det övervägs om fler skulle kunna föda vaginalt.

Frågeställning: Vilken nytta och risker för mamman och barnet har planerad vaginal födsel jämfört med planerat kejsarsnitt vid fullgången graviditet med lågt sittande moderkaka?

Metod: Etablerade metoder har använts för att väga samman aktuellt tillgängliga vetenskapliga resultat.

Resultat: Tre icke-randomiserade studier omfattade totalt 131 gravida med lågt sittande moderkaka, där man antingen planerade vaginal födsel eller kejsarsnitt. Alla tre studierna hade betydande metodologiska brister vilket gör att tilltron till de sammanlagda resultaten är mycket låg.

Av de 84 gravida kvinnor med lågt sittande moderkaka där en vaginal födsel var planerad födde 79% vaginalt (95% konfidensintervall: 70% till 87%). Inga dödsfall - varken av mor eller barn - rapporterades och inte heller några fall där kvinnan behövde intensivvård eller akuta insatser på grund av allvarliga blödningar efter födseln. I två studier observerades stora blödningar efter förlossningen oftare hos de kvinnor där man hade planerat kejsarsnitt. Ingen studie undersökte de kritiska utfallen för barnen, t.ex. behov av intensivvård, eller hur barnen utvecklades på längre sikt. Även data om amning vid utskrivning från sjukhuset, vårdtid på sjukhuset och mammans upplevelse av förlossningen saknas. Två studier rapporterade om flera graviditeter där moderkakan vid uppföljande ultraljudsundersökningar efter graviditetsvecka 32–36 och inför födseln inte längre var lågt sittande.

Slutsatser: Det har rapporterats att vaginal födsel varit möjlig för noggrant utvalda gravida kvinnor med lågt sittande placenta. På grund av det begränsade vetenskapliga underlaget som jämför planerad vaginal födsel och kejsarsnitt vid graviditet med lågt sittande moderkaka går det dock inte att dra några säkra slutsatser om nytta och risker med behandlingsvalet för mor och barn vilket även begränsar etiska och ekonomiska överväganden.

The above summaries were written by representatives of the HTA-centrum. The HTA report was approved by the regional board for the quality assurance of activity-based HTA.

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LP = Licensed Psychologist
MD = Medical Doctor
PhD Doctor of Philosophy
RN = Registered Nurse
RM = Registered Midwife
SLT = Speech-Language Therapist

3 Summary of findings

Outcome	Number of studies per study design, (Number of participants)	Absolute effect I: intervention – intended vaginal birth C: Comparator – intended caesarean section	Certainty of evidence GRADE*
Maternal outcomes			
Vaginal birth	Intervention group of 3 non-RCSs (n=84)	Outcome (in the intervention group only): Number (%) 66/84 (79%, 95% CI: 70% to 87%)	⊕OOO[1]
Maternal mortality	1 non-RCS (n=27)	Number of cases: I: 0/11 vs C: 0/16	⊕OOO[2]
Intensive care	1 non-RCS (n=86)	Number of cases: I: 0/62 vs C: 0/24	⊕OOO[2]
Emergency interventions due to PPH	2 non-RCSs (n=113)	Number of cases with hysterectomy: I: 0/73 vs C: 0/40	⊕OOO[2]
PPH ≥1000 mL	2 non-RCSs (n=104)	Number of cases: I: 12/73 vs C: 14/31 Peto OR (95% CI): 0.21 (0.08 to 0.60) RD (95% CI): -0.38 (-0.85 to 0.09)	⊕OOO[2]
Transfusion	1 non-RCS (n=18)	Number of cases: I: 0/11 vs C: 1/7	⊕OOO[2]
PPH ≥ 500 mL	1 non-RCS (n=18)	Number of cases: I: 7/11 vs C: 7/7	NA
Antenatal haemorrhage	2 non-RCSs (n=45)	Number of cases: Study 1[a]:I: 3/11 vs C: 0/7 Study 2[b]:I: 2/11 vs C: 4/16	⊕OOO[2]
No data on breastfeeding at discharge, length of hospital stay, and childbirth experience were reported.			
Neonatal outcomes			
Neonatal mortality	2 non-RCSs (n=45)	Number of cases: I: 0/22 vs C: 0/23	⊕OOO[2]
Perinatal mortality	1 non-RCS (n=86)	Number of cases I: 0/62 vs C: 0/24	⊕OOO[2]
Apgar score <4 at 5 minutes	1 non-RCS (n=27)	Number of cases: I: 0/11 vs C: 0/16	⊕OOO[2]
Umbilical cord arterial pH	2 non-RCSs (n=45)	Number of cases with abnormal pH I: 0/22 vs C: 0/23	NA
No data on neonatal intensive care unit stay, therapeutic hypothermia, or long-term child outcomes were reported.			

Footnotes: C: comparator (intended caesarean section), I: intervention (intended vaginal birth), non-RCS: non-randomized controlled study, PPH: Postpartum haemorrhage

[a] Antenatal bleeding defined as number with emergency caesarean section due to antenatal bleeding

[b] Antenatal bleeding was defined as warning bleeding that was not further specified.

[1] Evaluation based on treatment arm with planned vaginal birth only. Downgraded two steps for study limitations (lack of information on screening, one step for indirectness (e.g. exclusion of women with previous caesarean section)

[2] Starting from ⊕⊕OO for non-randomised controlled studies downgraded one step for study limitations, one step for imprecision, also some concerns regarding indirectness*

Certainty of evidence

High certainty ⊕⊕⊕⊕: We are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty ⊕⊕⊕O: We are moderately confident in the effect estimate. The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different from the estimate of the effect.

Low certainty ⊕⊕OO: Confidence in the effect estimate is limited. The true effect may be substantially different from the estimate of the effect.

Very low certainty ⊕OOO: We have very little confidence in the effect estimate. The true effect is likely to be substantially different from the estimate of effect.

4 Abbreviations

RCT	Randomised Controlled Trial
Non-RCS	Non-randomised Controlled Study
SFOG	Swedish Society of Obstetrics and Gynaecology
VGR	Region Västra Götaland

5 Background

A low-lying placenta is defined as a placental edge within two centimetres of the internal cervical os without covering it, to be distinguished from placenta previa, where the placenta covers the internal os (Reddy et al., 2014). The condition is associated with an increased risk of significant haemorrhage during and after pregnancy as well as an increased risk of preterm birth and emergency caesarean sections (Vahanian et al., 2015).

The placenta often migrates towards areas with a better blood supply as the pregnancy progresses and the lower uterine segment expands. This process can continue to a varying degree until birth. Therefore, many cases of low-lying placenta identified in early pregnancy will resolve by the time of birth. The diagnosis of low-lying placenta should therefore not be used before 32 weeks of gestation (Hagberg et al, 2014, Ohira et al., 2012, Oppenheimer et al., 2001, Salomon et al., 2022).

Publications and statistical reports often do not differentiate between low-lying placenta and placenta previa but provide combined numbers on the occurrence of these conditions. In combination with placenta previa, low-lying placenta affects approximately 5 of 1000 births globally, with a varying incidence depending on the occurrence of risk factors in different populations. In Sweden, the corresponding numbers are approximately 3 per 1000 births (Bolin et al., 2020). A lack of consensus regarding definitions makes comparison of different studies and their results difficult (Mastrolia et al., 2016). Since the Swedish diagnosis manual does not differentiate between placenta previa and low-lying placenta, there is no available data on how many births in Sweden are affected by low-lying placenta. In Italy, available statistics indicate an incidence of low-lying placenta of approximately 0.4% at term (Mastrolia et al., 2016, Ornaghi et al., 2021, SFOG, 2020).

Predisposing factors for low-lying placenta include previous uterine surgery, high maternal age, multiparity, smoking, previous low-lying placenta or placenta previa, and assisted reproductive technology (Kumari, 2022, Landsverk et al., 2025) Mastrolia et al., 2016). In the Nordic countries, the average caesarean section rate has almost doubled over the last 30 years, from a range of 7–12% in 1980 to 14–21% in 2010. In Sweden, the average caesarean section rate has increased from 18% in 2014 to 20% in 2024 (Skogsdal et al., 2025). As giving birth by caesarean section is a known risk factor for placenta previa and low-lying placenta in subsequent pregnancies, this development may imply increasing numbers of pregnancies with low-lying placenta in the future.

Although the established mode of birth for placenta previa is a caesarean section, there is no clear consensus on the mode of birth that should be recommended for women with a low-lying placenta at term (Jansen et al., 2019a). The risk of significant blood loss for the mother and infant from intraoperative bleeding must be considered when assessing the risks and benefits of each mode of birth (Jauniaux, 2019).

There are no available statistics regarding complications depending on the mode of birth for the population at issue. For the general population, caesarean sections are associated with an increased risk of maternal morbidity, including pulmonary embolism and infection, as well as uterine rupture, placenta accreta spectrum, and vasa previa in

subsequent pregnancies, and complications due to abdominal adhesions, such as intestinal obstruction. Potential benefits of caesarean sections may include reduced risk of pelvic floor dysfunction and perineal trauma, including severe perineal tears. (Abenheim et al., 2015, Andolf et al., 2010, Berg et al., 2023, Socialstyrelsen, 2018).

While being a lifesaving emergency procedure for many children, a caesarean section compared with an intended vaginal birth may be associated with an increased risk of need for neonatal intensive care, respiratory morbidity, and a long-term increased risk of asthma (Berg et al., 2023).

The normal pathway through the healthcare system and current waiting time for medical assessment/treatment

Placenta location is assessed as part of the routine mid-trimester fetal ultrasound scan, which is offered to all pregnant women within Swedish maternal health services.

Local guidelines in Region Västra Götaland (VGR) recommend the following management protocol for women with a low location of the placenta at routine second-trimester scans:

- Women with a low-lying placenta and additional risk factors for placenta accreta spectrum are offered assessment at 28 weeks of gestation; all women with a low location of the placenta are offered reassessment at 34 weeks of gestation.
- If the distance from the internal cervical os and the lower edge of the placenta is ≥ 2 cm at 34 weeks of gestation, the placental location is considered normal, and no further assessments are made.
- If the placental edge is 1-2 cm from the internal cervical os, at 34 weeks of gestation vaginal birth is considered with a plan to handle an increased risk of bleeding.
- If the placental edge is ≤ 1 cm from the internal os, reassessment is performed at 36 weeks of gestation. If the location of the lower edge of the placenta remains unchanged, a caesarean section should be considered.

An individualised approach is recommended for patients with recurrent antenatal haemorrhage. No reassessment of placental location is made after 36 weeks of gestation (Sahlgrenska Universitetssjukhuset, 2026).

Number of patients per year who undergo current treatment regimen

The annual number of women with low-lying placenta in Sweden is not known, as the Swedish International Classification of Disease -10 does not differentiate between low-lying placenta and placenta previa, nor does it provide information on whether the diagnosis persists until birth or resolves antenatally. However, using local statistics from diagnosis registration regarding low-lying placenta and placenta previa, we estimate that 71-98 births in VGR per year are affected by low-lying placenta or placenta previa at the

time of birth, and that only 2-13 of these women are admitted for a trial of labour. Between January 2017 and April 2026, a total of 788 women with a diagnosis of placenta previa or low-lying placenta gave birth in VGR. Of these, 2.9% were vaginal births. The data are not limited to pregnancies at term (Wallstersson, 2026).

Present recommendations from medical societies or health authorities

The Swedish Society of Obstetrics and Gynaecology recommends establishing a birth plan at 32-34 weeks of gestation. Women with a placental edge between 11-20 mm of the internal cervical os may be planned for vaginal birth, with special attention to the risk of haemorrhage. Women with a placental edge ≤10 mm of the internal os should be planned for re-examination at 36 weeks of gestation and primarily recommended caesarean section if the low-lying placenta has not been resolved by then. The need for an individualised approach is emphasised, and recurrent antepartum bleeding episodes may warrant iatrogenic preterm birth by caesarean section (Bolin et al., 2020).

The Royal College of Obstetricians and Gynaecologists, United Kingdom, recommends an individualised approach for women with uncomplicated low-lying placenta with respect to the woman's preference, medical history, and ultrasound findings, including the distance between the placental edge and the fetal head position relative to the leading edge of the placenta, whilst clearly stating that there is a lack of randomised controlled trials (RCT) regarding this group. For women with repeated antepartum bleeding, late preterm birth may be considered at 34-36 weeks of gestation (Jauniaux, 2019).

The corresponding guidelines are also available from Canada (Jain et al., 2020) and the USA (Silver, 2015).

6 Health Technology at issue: Maternal and neonatal risks and benefits of management with intended vaginal birth in term singleton pregnancies with low-lying placenta

Current recommendations suggest that women with a placental edge 11–20 mm from the internal cervical os may be considered for vaginal birth, whereas caesarean section is generally recommended for women with a placental edge ≤10 mm from the internal os. Increasing the proportion of women with a low lying placenta who undergo a trial of labour could potentially reduce surgery-related complications and the risk of placental complications in subsequent pregnancies, including recurrent low-lying placenta, placenta accreta spectrum, and vasa previa. Regarding neonatal outcomes, the aim is to diminish the need for neonatal intensive care unit (NICU) admission, need for respiratory support, and lessen the long-term risk of asthma.

7 Focused question

Does management with an intended vaginal birth for singleton term (≥37 weeks+0 days) pregnancies with low-lying placenta have clinical benefits and risks for mother and infant compared to management with an intended caesarean sectio

PICO	
P	Women with term (≥37 weeks+0 days[1]) singleton pregnancy with cephalic presentation and low-lying placenta, defined as the placental edge reaching 0-20 mm from the internal os according to third trimester vaginal ultrasound (placenta accreta spectrum excluded)
I	Intended vaginal birth
C	Intended caesarean section
O	**Critical for decision-making:** Maternal outcomes: • Vaginal delivery (main outcome in Prospero) • Maternal mortality • Intensive care • Emergency interventions: (e.g. hysterectomy, uterine ballon tamponade, embolization) • Postpartum haemorrhage (PPH) ≥1000 mL (main outcome in Prospero) Neonatal outcomes: • Neonatal mortality[2] • Perinatal mortality • Neonatal Intensive Care Unit >4 days (main outcome in Prospero) • Therapeutic hypothermia[2] • Apgar score <6 at 10 minutes[2] (alternatively, Apgar score <4 at 5 minutes) • Long-term child outcome (neurodevelopmental or physical problems) **Important (but not critical for decision-making):** Maternal outcomes: • Antenatal haemorrhage • Transfusion • Postpartum haemorrhage (PPH) ≥500 mL[3] • Length of hospital stay • Childbirth experience (measured with validated scale) Neonatal outcomes: • Neonatal Intensive Care Unit[2,3] • Umbilical cord arterial pH[3,4] **Less important for decision making** Maternal outcomes: • In the group with intended vaginal delivery: Indication for caesarean section (e.g. failure to progress, fetal distress, bleeding)[3] • Breast feeding at discharge[2]

[1] Clarified by protocol amendment that studies including women giving birth before 37 weeks' gestation were eligible if the mean gestational age in the study was 37 weeks or later, and no more than 20% of women gave birth before 37 weeks' gestation.
[2] In line with the Swedish perinatal Core Outcome Set (SpeCOS) (Savchenko et al., 2023)
[3] For this outcome no GRADE assessment will be performed
[4] This outcome was added post-hoc

The literature search was restricted to RCTs, non-randomised controlled studies (non-RCSs), case series with more than 150 women, and case reports (information regarding mortality only) published from 2010 onwards (start date chosen to identify studies using the vaginal ultrasound technique corresponding to the current standard for diagnosing the condition). Systematic reviews published since 2015 were considered in the discussion.

The relevance of the included clinical outcomes was confirmed by patient representatives.

8 Method

Systematic literature search (Appendix 1)

During January 2026, two of the authors (JG, IS), both medical librarians experienced in systematic review searching, performed literature searches in the following databases: MEDLINE (OvidSP), Embase (OvidSP), and Cochrane Library. Websites of Scandinavian national and regional HTA organisations were also visited. Additionally, a citation search of relevant reports was performed in Web of Science. Search strategies, eligibility criteria, and a graphic presentation of the selection process are presented in Appendix 1. These authors conducted the literature searches and screened the obtained abstracts independently to decide eligibility for full-text retrieval. All abstracts were screened using the Rayyan tool (Ouzzani et al., 2016). Any disagreements were resolved by consensus. All full-text reports were read by at least two authors independently, and it was finally decided in a consensus meeting which reports should be included in the assessment.

The protocol was registered in PROSPERO (CRD420251013834) prior to the final selection of studies and data extraction. An amendment was made prior to data extraction to clarify that studies including women who gave birth before 37 weeks of gestation were eligible, provided that the mean gestational age was 37 weeks or later, and no more than 20% of participants gave birth before 37 weeks of gestation.

Critical appraisal and certainty of evidence

For included studies, relevant data were extracted by one author and confirmed by at least one other author, with discrepancies resolved by consensus. The included articles were independently appraised for directness, risk of bias, and precision. Regarding directness and precision, a checklist developed by the HTA-centrum, Sahlgrenska University Hospital, was used. For the assessment of risk of bias, a Swedish translation of the ROBINS-I tool (SBU, 2024, Sterne et al., 2016) developed by the Swedish Agency for Health Technology Assessment and Assessment of Social Services was used. Consensus discussions were held to agree on the assessment of each study regarding directness, study limitations (risk of bias), and precision in the categories

+ (no or minor problems), ? (some problems), and – (major problems). These assessments are summarised in Appendix 5.

The following analyses were planned, depending on the availability of data: If two or more studies provided dichotomous data regarding the outcomes at issue that could be pooled, forest plots were produced and random effects meta-analyses were performed to obtain odds ratios (OR) and risk difference (RD), including 95% confidence intervals (CI). Analyses were performed using Stata version 19.5 (StataCorp LLC, College Station, TX, USA) and Review Manager 5.4 (The Nordic Cochrane Centre, The Cochrane Collaboration, Copenhagen, Denmark) as applicable.

The certainty of evidence was assessed according to GRADE (Atkins et al., 2004), and reasons for downgrading are described. Summary results per outcome and the associated certainty of evidence are presented in a Summary-of-findings table.

Protocol deviations

Umbilical cord arterial pH at birth was considered during protocol development but was not included as a predefined outcome. Following the initial assessment of the included studies, which revealed limited reporting of neonatal outcomes, umbilical cord arterial pH was added as an additional outcome.

Ongoing research

A search in Clinicaltrials.gov was conducted (05 May 2026) using the search terms *(placenta OR placental OR placentas) AND (previa OR previas OR praevia OR praevias OR low OR lowlying OR lowlocated OR lowlocation OR lowinserted OR lowinsertion OR lowimplanted OR lowimplantation OR lowposition OR lowpositioned OR lowsite OR lowsites OR lowsituated)* in the Condition field.

9 Results

Search results and study selection (Appendix 1)

Literature searches via databases and other methods identified 3,510 records after deduplication by DedupEndNote (Lobbestael, 2023). After title and abstract screening, 3,377 records were excluded. 133 reports were sought for retrieval. Six reports could not be retrieved, and 124 reports were excluded after full-text reading. Three reports (non-randomised controlled studies) were finally included in the assessment (Appendix 2). In addition, one systematic review (SR) was commented upon.

Included studies

Three non-randomised controlled studies were included: Ornahgi et al. (2022); Taga et al. (2017) and Yamamoto et al. (2024) (see study characteristics in Appendix 2).

All studies had some or serious limitations regarding directness, with poorly defined study populations and populations only partially comparable to the Swedish population of pregnancies with low-lying placenta. All three non-RCSs were assessed as having a high risk of bias, with substantial differences in baseline characteristics between the

intervention and comparison groups, and in two of the three studies, the mode of birth was determined solely by patient and physician preference.

Given the rarity of the condition, all studies were affected by imprecision due to small sample sizes and the absence of power calculation.

Specific issues related to each outcome are stated separately below. All outcomes in this report are based on the population of singleton pregnancies with a low-lying placenta, and comparisons are made with respect to the planned mode of birth, except for the outcome vaginal birth, for which solely data from the group of women who were planned for vaginal birth were included.

Both Taga et al. (2017) and Ornahgi et al. (2022) continued to follow women with low-lying placenta using repeated ultrasound examinations to assess placental migration beyond 32–36 weeks of gestation. For several of the included women, these follow-up examinations showed that the placenta had migrated to a position >20 mm from the internal os by the time of birth. In Taga et al. (2017), the condition resolved in six of the 11 women with an intended vaginal birth, whereas in Ornahgi et al. (2022), it resolved in 21 of 86 women. In Ornahgi et al. (2022), the mean gestational age at the last ultrasound examination among women with resolved low-lying placenta was 36.5 ± 1.5 weeks. In our analysis, we included these women (where possible, describing separate results) even when follow-up examinations indicated that the low-lying placenta had resolved, because repeated ultrasound examinations to monitor placental location after 36 weeks are not part of current clinical practice in VGR. Consequently, similar resolution of the condition may not have been detected in other women and therefore would not have been observed.

Results per outcome

Critical for decision making:

Maternal outcomes:

Vaginal birth (appendix 4.1)

All three studies reported the success rate of trial of labour among women with a low-lying placenta and the indications for emergency caesarean sections among those with an intended vaginal birth.

For the three studies, the total number of pregnancies with trial of labour and the number of those resulting in vaginal birth are provided in Figure 1. Across the three studies, the overall rate of vaginal births in pregnancies with low-lying placenta and trial of birth was 66/84 (79%). (Note, that the condition of low-lying placenta had resolved prior to birth for 17 of 62 patients with intended vaginal birth in Ornaghi et al., 2022, and for six of 11 in Taga et al., 2017. No such information is available for Yamamoto et al., 2024).

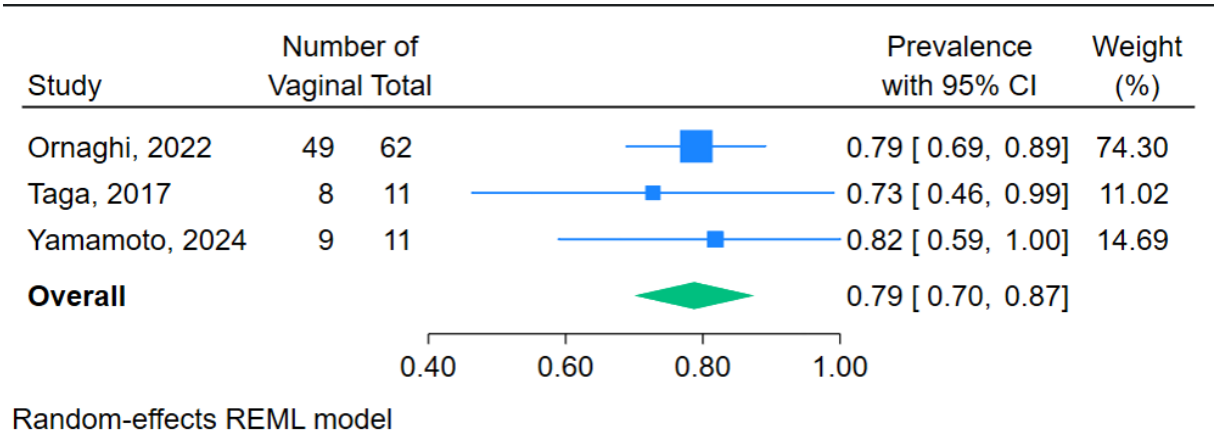


Figure 1: Forest plot and meta-analysis of the proportion of vaginal births in women with planned vaginal birth using a random-effects restricted maximum likelihood model.

Of the women with an intended vaginal birth, 18/84 (21%) had an emergency caesarean section, either prior to or during labour for the following reasons:

Ornaghi et al. (2022): Urgent pre-labour caesarean section due to bleeding (n = 8), excessive bleeding during the first stage of labour (n = 1), abnormal fetal tracing (n = 1), abnormal fetal heart rate (n = 1), failure to progress (n = 1), and brow presentation (n = 1).

Taga et al. (2017): Three urgent pre-labour caesarean sections were performed, all due to uncontrollable antenatal bleeding.

Yamamoto et al. (2024): Two emergency caesarean sections due to labour arrest.

Conclusion: It is uncertain to what extent women with low-lying placenta can give birth vaginally when admitted for trial of labour (very low certainty of evidence GRADE ⊕OOO).

Maternal mortality (appendix 4.2)

Only one study including 27 women reported data on maternal mortality (Yamamoto et al., 2024), with no maternal mortality observed.

Conclusion: It is uncertain whether there is any difference in maternal mortality between management of intended vaginal birth compared with intended caesarean section in women with a low-lying placenta (very low certainty of evidence, GRADE ⊕OOO).

Need for maternal intensive care (appendix 4.3)

Maternal intensive care was listed as an outcome variable in one study with 86 women (Ornaghi et al., 2022), with no cases reported in either group.

Conclusion: It is uncertain whether there is any difference in need for maternal intensive care between management of intended vaginal birth compared with intended caesarean section in women with low-lying placenta (very low certainty of evidence, GRADE ⊕OOO).

Emergency interventions due to postpartum bleeding (appendix4.4)

The definition of emergency interventions due to postpartum bleeding in this project comprised e.g., hysterectomy, uterine balloon tamponade, and embolisation. In the included studies, only the need for hysterectomy was listed as an outcome variable in two studies with a total of 113 women (Ornaghi et al., 2022, Yamamoto et al., 2024) reporting no cases of hysterectomy in either group.

Conclusion: It is uncertain whether there is any difference in hysterectomy rates due to postpartum bleeding between management of intended vaginal birth compared with intended caesarean section in women with low-lying placenta (very low certainty of evidence, GRADE ⊕OOO).

Postpartum haemorrhage ≥1000 mL appendix 4.5)

Postpartum haemorrhage was reported in all three studies. In the study by Ornaghi et al. (2022), postpartum haemorrhage was defined as blood loss ≥1000 mL. The rate of postpartum haemorrhage was 13% for the intended vaginal birth group and 29% for the group with an intended caesarean section (results by intended mode of birth received upon request from the authors, as the publication only presents results based on actual mode of birth).

Taga et al. (2017) used the term intrapartum blood loss, defined as blood loss within two hours of vaginal birth or intraoperative blood loss for caesarean section. In the intended vaginal birth group, 36% had an intrapartum blood loss of ≥1000 mL, and in the intended caesarean section group, 100% had an intrapartum blood loss of ≥1000 mL. (Note, these results were received upon request from the authors. The publication only presents results in terms of PPH≥1500g.)

Pooling the two studies, 16% in the group with an intended vaginal birth had a postpartum haemorrhage ≥1000 mL, compared to 45% in the group with an intended caesarean section, resulting in a Peto OR 0.21 (0.08 to 0.60) favouring an intended vaginal birth (Figure 2) and RD (95% CI) -0.38 (-0.85 to 0.09).

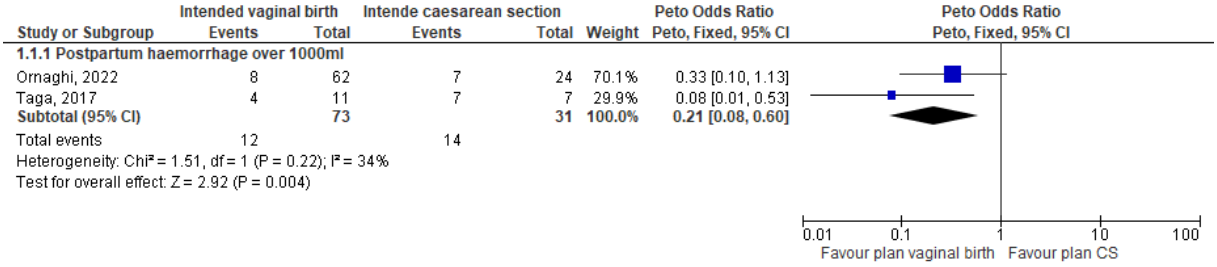


Figure 2: Forest plot and Peto Odds Ratio of postpartum haemorrhage ≥1000 mL

In the study by Yamamoto et al. (2024), abnormal haemorrhage was defined as blood loss ≥800 mL following vaginal birth and ≥1500 mL following caesarean section. Different methods of assessing blood loss were used depending on the mode of birth. Abnormal haemorrhage occurred in 4 of 11 women (36%) in the intended vaginal birth group and in 3 of 16 women (19%) in the planned caesarean section group (p = 0.391).

Conclusion: It is uncertain whether there is any difference in the risk of postpartum haemorrhage ≥1000 mL between the management of intended vaginal birth compared with intended caesarean section in women with low-lying placenta. (Very low certainty of evidence (GRADE ⊕OOO).

Neonatal outcomes

Neonatal mortality and perinatal mortality (appendix 4.6)

Two studies (Taga et al., 2017, Yamamoto et al., 2024) reported data regarding serious neonatal complications and death. During the study period, no such events were observed in either the group planned for vaginal birth (0/22) or the planned caesarean section group (0/23).

The study by Ornaghi et al.,2022 reports that no perinatal mortality occurred neither in the group planned for vaginal birth (0/62) nor the planned caesarean section group (0/24).

Conclusion: Regarding neonatal and perinatal mortality, it is uncertain whether there is any difference between the management of intended vaginal birth and intended caesarean section. (Very low certainty of evidence, GRADE ⊕OOO)

Neonatal intensive care > 4 days, therapeutic hypothermia, and long-term child outcome (neurodevelopmental or physical) were not reported as outcomes in any of the included studies.

Apgar score (appendix 4.7)

No studies have reported on Apgar score < 6 at 10 minutes. One study (Yamamoto et al., 2024) (n=27) reported on Apgar score at 5 minutes and found no cases below 4 in either group.

Conclusion: It is uncertain whether there is any difference in the occurrence of Apgar score <4 at 5 minutes between the management of intended vaginal birth compared with intended caesarean section in women with low-lying placenta. (Very low certainty of evidence, GRADE ⊕OOO).

Important (but not critical for decision making):

Maternal outcomes:

Antenatal haemorrhage (Appendix 4.8)

Two studies reported on antenatal haemorrhage in relation to the intended vaginal birth or intended caesarean section (n=45).

In the study by Taga et al. (2017), uncontrollable antepartum bleeding occurred in three of 11 women (27%) in the intended vaginal birth group and in none of the women in the planned caesarean section group (0/7). However, the timing of the bleeding was not specified, and it is unclear whether these events occurred before or after the onset of labour.

In the study by Yamamoto et al. (2024) warning bleeding (defined as bleeding occurring before the onset of labour in the absence of signs of placental abruption) occurred in 2 of 11 women (18%) in the intended vaginal birth group and in 4 of 16 women (25%) in the intended caesarean section group.

Interpretation is limited by the heterogeneity of outcome definitions and a lack of information regarding the timing of bleeding in relation to labour onset.

Conclusion: It is uncertain whether there is any difference in the occurrence of antenatal bleeding between management of intended vaginal birth compared with intended caesarean section in women with low-lying placenta. (Very low certainty of evidence, GRADE ⊕OOO).

Transfusion (Appendix 4.9)

One study (Taga et al., 2017) reported the provision of transfusion in relation to the intended mode of birth (n=18). No women in the intended vaginal birth group (0/11) needed transfusion compared with one woman (1/7) in the intended caesarean section group (p =0.197).

Conclusion: It is uncertain whether there is any difference in the need for transfusion between the management of intended vaginal birth and intended caesarean section in women with a low-lying placenta. (Very low certainty of evidence, GRADE ⊕OOO)

Postpartum haemorrhage ≥500 mL (Appendix 4.10)

Upon request, supplementary data on postpartum haemorrhage ≥500 mL were provided for the study by Taga et al. (2017) with a frequency of 64% (7/11) for the intended vaginal birth group and 100% (7/7) for the intended caesarean section group.

Conclusion: It is uncertain whether there is any difference in the risk of postpartum haemorrhage between management of intended vaginal birth compared with intended caesarean section in women with low-lying placenta.

No data on **childbirth experiences** or **length of hospital stay** were reported.

Neonatal outcomes

No data regarding **neonatal intensive care unit admission** in relation to the intended mode of birth were reported.

Umbilical arterial pH at birth (Appendix 4.11)

Two studies (Yamamoto et al., 2024, Taga et al., 2017) with a total of 45 pregnancies reported data on umbilical cord arterial pH. No cases of abnormal umbilical arterial pH were reported.

Less important for decision making

No data on **breastfeeding at the time of discharge** were reported.

10 Ethical aspects

The absence of robust evidence on key maternal and neonatal benefits and risks for the intended mode of birth in pregnancies with a low-lying placenta is striking and warrants further research. From a human dignity perspective, women with a low-lying placenta have an equal entitlement to receive scientifically well-grounded information regarding the potential risks and benefits of different modes of birth. If intended vaginal birth and caesarean sections were shown to be equally safe in this population, offering a genuine choice would be ethically warranted and may strengthen women's autonomy. Although the included studies did not report serious neonatal harm, any efforts to expand access

to trial of labour should be undertaken with heightened vigilance and a specific focus on neonatal outcomes.

It is uncertain whether aiming for vaginal birth in a higher proportion of women with a low-lying placenta would lead to displacement effects. However, the absolute number of women with this condition is small, and according to the needs and solidarity principle, pregnant women with a low-lying placenta have an increased risk of complications both during and after pregnancy, motivating their needs to take precedence over others.

Finally, the cost effectiveness of choosing between intended modes of birth in this context is currently uncertain.

11 Organisational aspects

Currently, there is a lack of robust evidence regarding which mode of birth should be recommended for women with low-lying placenta, and it is premature to specify organisational changes at this time. If future research supports trial of labour as a safe option for women with low-lying placenta, implementation would likely be feasible within existing labour and birth care in VGR. However, appropriate clinical guidelines, staff awareness, and preparedness to manage potential complications need to be ensured. Given the small number of pregnancies with a low-lying placenta, the effect of any organisational changes would most likely be small.

12 Economic aspects

In VGR, approximately 71 to 98 women with a diagnosis of O.44 placenta previa (including low-lying placenta) give birth each year. More detailed estimates cannot be obtained because the current diagnosis manual does not distinguish between placenta previa and low-lying placenta.

Given the limited scientific evidence on the clinical benefits and risks of the intended mode of birth, any attempt to describe the economic effects of expanding the proportion of women with an intended vaginal birth would be highly speculative.

However, estimates of healthcare costs according to mode of birth and level of complications are available for births in VGR. These are presented in Table 1.

Method of birth	Non complicated birth	Complicated birth	Very complicated birth
Vaginal birth	39,868 SEK	64,121 SEK	104,137 SEK
Caesarean section	81,098 SEK	109,227 SEK	170,601 SEK

Table 1: Estimates of inpatient costs per birth depending on mode the of birth and severity of complications, based on current data from VGR Diagnosrelaterade grupper (DRG) codes[1].

[1] DRG codes are codes used to group healthcare episodes with similar diagnoses, treatments, and resource use, in order to describe and compare healthcare and costs.

Compared with pregnancies in general, women with a low-lying placenta have a higher risk of complications, and it can be assumed that the costs of inpatient care for these cases fall within the complicated to very complicated range. Costs and cost differences depending on the mode of birth cannot therefore be easily generalised from pregnancies in general to pregnancies with low-lying placenta.

In addition to the inpatient costs at birth, costs associated with outpatient care and long-term outcomes must also be considered. Given the small number of cases, we do not expect any future changes in the treatment regime to affect the budget negatively.

13 Discussion

Summary of main results

This HTA-report aimed to compare the risks and benefits of intended vaginal birth with intended caesarean section in women with a low-lying placenta at term, for the mother and infant.

Three non-randomised studies (n=131) were included; however, due to limitations of the evidence, no reliable conclusions could be drawn for any of the predefined maternal or neonatal outcomes. Among women who underwent trial of labour, 79% had a vaginal birth, (21% had an emergency caesarean section (including approximately 14% requiring an emergency caesarean section due to bleeding). For postpartum haemorrhage ≥ 1000 mL, the results favoured an intended vaginal birth. However, the certainty of evidence was very low. No maternal, neonatal, or perinatal deaths, obstetric hysterectomies, intensive care admissions, Apgar scores <4 at 5 minutes, or cases with abnormal arterial umbilical cord pH were reported in any of the studies.

In addition, for antenatal haemorrhage and the need for transfusion, the available data were inconclusive.

Overall completeness and applicability of evidence

Scientific evidence on the benefits and risks of intended vaginal birth for women with a low-lying placenta remains sparse; the evidence at hand was limited to three small underpowered observational studies with high risk of bias and some indirectness. Still, a relevant proportion of women with a low-lying placenta who underwent a trial of labour were reported to achieve vaginal birth. Although the pooled analysis suggested a lower risk of postpartum haemorrhage ≥1000 mL with intended vaginal birth, the certainty of evidence was very low, precluding reliable conclusions. The allocation to an intended vaginal birth or caesarean section was done in a way that introduced substantial bias. In two of the three studies, women with prior caesarean sections were either excluded or assigned to an intended caesarean section, and group allocation was determined according to the physician and/or patient preference. In one study, only women with an internal os to placenta distance >10 mm were recommended trial of labour. Therefore, it is uncertain whether these results are generalisable and applicable to the Swedish context; thus, further research is warranted.

Two of the three studies included women with a low-lying placenta, which according to additional follow-up examinations, resolved after 36 weeks of gestation. We chose to include these studies in the analysis after careful consideration by the expert group. Women in VGR today are not routinely scheduled for re-evaluation visits to reassess placental position after 36 weeks of gestation. Thus, the patient group in our setting is likely to include both women with persistent and resolved low-lying placenta at the time of birth. By extension, it is plausible that with current management, many women with low-lying placenta that resolves after 36 weeks gestation, give birth through caesarean section, despite resolution. Thus, further reassessment of placental position could be valuable.

Agreements and disagreements with other studies and reviews

A systematic review by Jansen et al. (2019a) was included for appraisal and discussion. The research question of the publication was considered insufficiently clear and did not fully correspond to the research question at issue in the present HTA project. Appraisal using SnabbSTAR (SBU, 2026) further showed limitations in the steps of risk of bias assessment and meta-analyses. Furthermore, in our assessment of the publication, the overall conclusion by Jansen et al. (2019a) that "A low-lying placenta is not a contraindication for a trial of labour, and the morbidity in these women is not increased " is not clearly supported by the analyses presented in the publication.

14 Future perspectives

Scientific knowledge gaps and implications for research

Further research is warranted to assess the maternal and perinatal benefits and risks of management with an intended vaginal birth compared to an intended caesarean section among women with a low-lying placenta. However, there are no ongoing or published RCTs on this topic.

The need for more robust evidence in this field is substantial. The patient group was small, and the outcomes we aimed to assess were rare. One or several well-designed large, controlled studies on the effects of planned mode of birth on the mortality and morbidity of mothers and infants would help to elucidate the potential benefits and risks.

Ongoing research

A search in Clinicaltrials.gov (May 5, 2026) identified 131 trials. The trials were screened for title or abstract. No ongoing studies addressing our PICO were identified.

15 Participants in the project

The question was nominated by

Anneli Falk, RN,RM, Head of Department, Department of Obstetrics and Gynaecology, Sahlgrenska University Hospital, Gothenburg, Region Västra Götaland, Sweden.

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and

Ulrika Ådén MD, PhD, Professor, neonatology Department of comen's and Children's Health, Karolinska Institutet, Stockholm, Sweden

have been appointed to review this report.

Declaration of interests

The authors report no conflicts of interest related to the content of this Health Technology Assessment.

Project time

The HTA was accomplished during the period of 2025-11-25 to 2026-11-01
Literature searches were conducted on 2026-01-09.

Components of this Health Technology Assessment

- ✓ Description of methods
- ✓ PICO
- ✓ Full literature search
- ✓ Flowchart
- ✓ Selection based on relevance
- ✓ Quality assessment
- ✓ Data tabulation
- ✓ Evidence synthesis
- ✓ Meta-analysis
- ✓ Certainty of evidence by GRADE
- ✓ Summary
- ✓ Economical aspects
- ✓ Organisational aspects
- ✓ Ethical aspects
- ✓ Ongoing studies
- ✓ Excluded articles
- ✓ Participation of experts
- ✓ External review
- ✓ Knowledge gaps identified
- ✓ Conflict of interest reported

Appendix 1: PICO, study selection, search strategies and references

Question(s) at issue:

Does management with intended vaginal birth for singleton term (≥37 weeks+0 days) pregnancies with low-lying placenta have clinical benefits and risks for mother and infant compared to management with intended caesarean section?

PICO: (P=Patient I=Intervention C=Comparison O=Outcome)

P	Women with term (≥37 weeks+0 days[1]) singleton pregnancy with cephalic presentation and low-lying placenta, defined as the placental edge reaching 0-20 mm from the internal os according to third trimester vaginal ultrasound (placenta accreta spectrum excluded)
I	Intended vaginal birth
C	Intended caesarean section
O	**Critical for decision making:** Maternal outcomes: • Vaginal delivery (main in Prospero) • Maternal mortality • Intensive care • Emergency interventions: (e.g. hysterectomy, uterine ballon tamponade, embolization) • PPH – postpartum haemorrhage ≥ 1000 ml (main in Prospero) Neonatal outcomes: • Neonatal mortality[2] • Perinatal mortality • Neonatal Intensive Care Unit >4 days (main in Prospero) • Therapeutic hypothermia[2] • Apgar score <6 after 10 minutes[2] (alternatively, Apgar score <4 after 5 minutes) • Long-term child outcome (neurodevelopmental or physical problems) **Important (but not critical for decision making):** Maternal outcomes: • Antenatal haemorrhage • Transfusion • PPH – postpartum haemorrhage ≥ 500 ml[3] • Length of hospital stay • Childbirth experience (measured with validated scale) Neonatal outcomes: • Neonatal Intensive Care Unit[2,3] • Umbilical cord arterial pH[3,4] **Less important for decision making** Maternal outcomes: • In the group with intended vaginal delivery: Indication for caesarean section (e.g. failure to progress, fetal distress, bleeding)[3] • Breast feeding at discharge[2]

[1] Clarified by protocol amendment that studies including women giving birth before 37 weeks gestation were eligible, if the mean gestational age in the study was 37 weeks or later, and no more than 20% of women gave birth before 37 weeks gestation.
[2] In line with the Swedish perinatal Core Outcome Set (SpeCOS), Savchenko et al., 2023.
[3] For this outcome no GRADE assessment will be performed
[4] This outcome was added post-hoc

Eligibility criteria

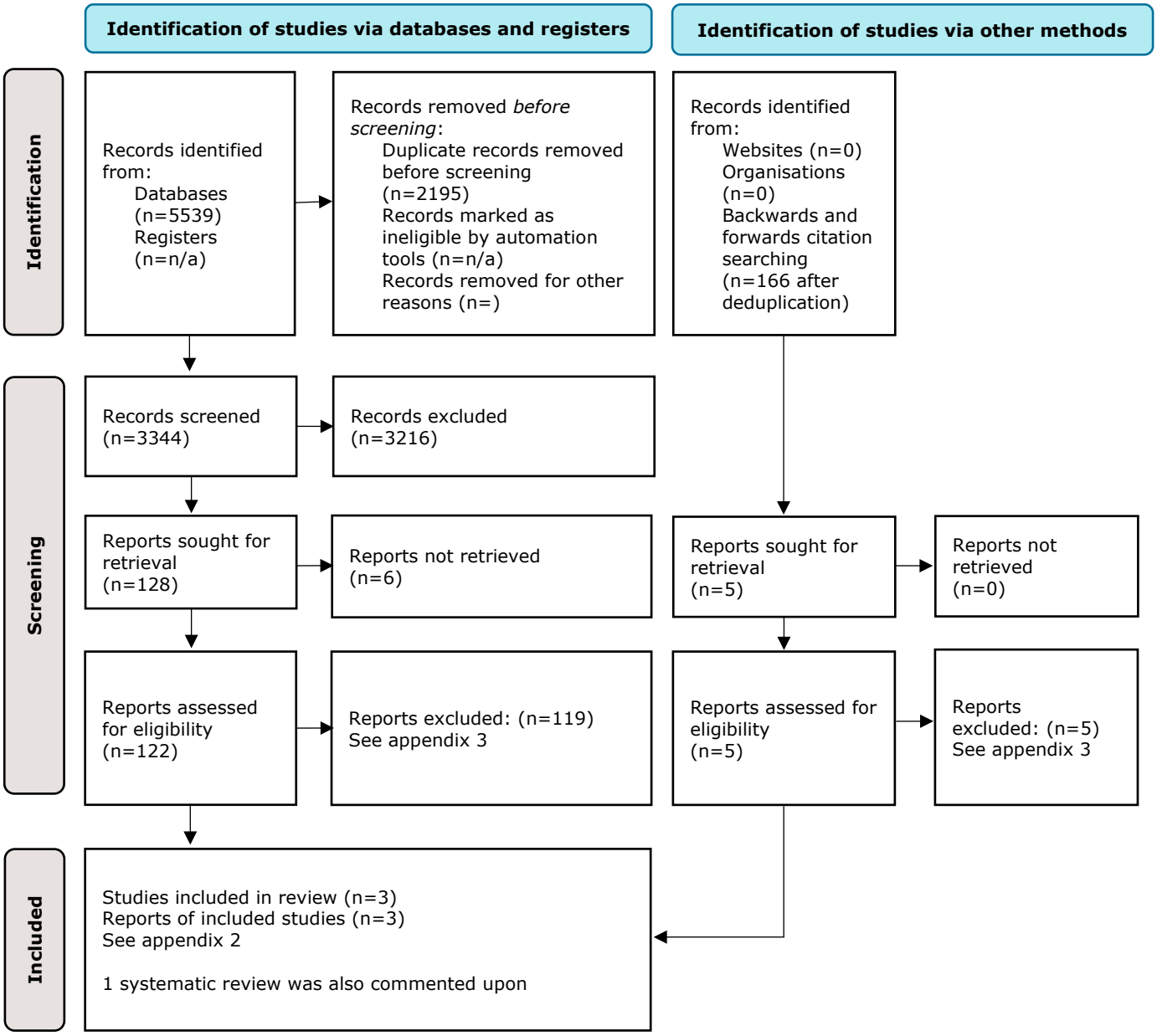
Study design:
Systematic reviews (to be used for discussion)
Randomised controlled trials
Non-randomised controlled studies
Case series ≥150 patients
Case reports (information regarding mortality only)

Language:
Danish, English, Norwegian, Swedish

Publication date:
2010-
Systematic reviews: 2015-

Selection process – flow diagram

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources



Adapted from: Page et al., 2021

Search strategies

Database: Ovid MEDLINE(R) ALL
Date: 09 Jan 2026
No. of results: 2,656

#	Searches	Results
1	exp Placenta Previa/	3624
2	(placent* adj5 pr?evia*).ab,kf,ti.	5224
3	((low or low-lying or lowlying or low-locat* or lowlocat* or low-insert* or lowinsert* or low-implant* or lowimplant* or low-posit* or lowposit* or low-sit* or lowsit*) adj3 placent*).ab,kf,ti.	1294
4	(placent* adj3 marginal*).ab,kf,ti.	136
5	1 or 2 or 3 or 4	7280
6	exp Delivery, Obstetric/	97695
7	(deliver* or birth* or childbirth*).ab,kf,ti.	1400126
8	6 or 7	1438092
9	5 and 8	4476
10	animals/ not (animals/ and humans/)	5377396
11	9 not 10	4442
12	comment.pt.	1059792
13	11 not 12	4346
14	**limit 13 to (yr="2010 -Current" and (danish or english or norwegian or swedish))**	**2656**

Database: Embase 1974 to 2026 January 07 (OvidSP)
Date: 09 Jan 2026
No. of results: 2,744

#	Searches	Results
1	exp *placenta previa/	2597
2	(placent* adj5 pr?evia*).ab,kf,ti.	7238
3	((low or low-lying or lowlying or low-locat* or lowlocat* or low-insert* or lowinsert* or low-implant* or lowimplant* or low-posit* or lowposit* or low-sit* or lowsit*) adj3 placent*).ab,kf,ti.	1962
4	(placent* adj3 marginal*).ab,kf,ti.	205
5	1 or 2 or 3 or 4	9094
6	exp vaginal delivery/	54428
7	(deliver* or birth* or childbirth*).ab,kf,ti.	1912910
8	6 or 7	1923505
9	5 and 8	6144
10	animal/ not (animal/ and human/)	1276661
11	9 not 10	6137
12	**limit 11 to ((embase or medline) and (danish or english or norwegian or swedish) and yr="2010 -Current")**	**2744**

Database: The Cochrane Library, Reviews and Trials only
Date: 09 Jan 2026
No of results: 139
Cochrane reviews: 2
Trials: 137

ID	Search	Hits
#1	MeSH descriptor: [Placenta Previa] explode all trees	86
#2	((placent* NEAR/4 previa*) OR (placent* NEAR/4 praevia*)):ti,ab,kw	591
#3	(((low OR (low NEXT lying) OR lowlying OR (low NEXT locat*) OR lowlocat* OR (low NEXT insert*) OR lowinsert* OR (low NEXT implant*) OR lowimplant* OR (low NEXT posit*) OR lowposit* OR (low NEXT sit*) OR lowsit*) NEAR/2 placent*)):ti,ab,kw	47
#4	(placent* NEAR/2 marginal*):ti,ab,kw (Word variations have been searched)	5
#5	#1 OR #2 OR #3 OR #4	629
#6	MeSH descriptor: [Delivery, Obstetric] explode all trees	7568
#7	(deliver* OR birth* OR childbirth*):ti,ab,kw (Word variations have been searched)	159358
#8	#6 OR #7	161452
#9	#5 AND #8	491
#10	(clinicaltrials OR trialsearch):so	604743
#11	(conference proceeding):pt	273776
#12	#10 OR #11	878519
#13	#9 NOT #12	170
Limit reviews to publication year 2015-2026 and trials to publication year 2010-2026		**139**

The websites listed below were visited 09 Jan 2026.
Nothing relevant to the question at issue was found.

Source	Search terms / Browsing	No. of results	No. of relevant results
SBU www.sbu.se ”Visa även träffar äldre än 5 år”	Placenta Moderkaka	7 29	0 0
Folkehelseinstituttet (Norge) https://www.fhi.no/	Placenta Morkake	14 35	0 0
Behandlingsrådet (Danmark) https://behandlingsraadet.dk/	Browsat		0
Nationale Kliniske Anbefalinger og Retningslinjer (Danmark) https://www.sst.dk/	Browsat		0
CAMTÖ https://www.regionorebrolan.se/sv/forskning/kontakt-och-organisation/hta-enheten-camto/	Browsat		0
HTA Region Stockholm https://www.chis.regionstockholm.se/hta/rapporter/	Browsat		0
HTA Region Värmland https://www.regionvarmland.se/vardgivarwebben/vard-och-behandling/kunskapsbaserad-halso--och-sjukvard/health-technology-assessment-hta	Browsat		0
Regional samverkansgrupp HTA (tidigare Metodrådet) i Sydöstra sjukvårdsregionen https://sydostrasjukvardsregionen.se/samverkansgrupper/hta/genomforda-bedomningar/	Browsat		0

HTA Syd https://vardgivare.skane.se/kompetens-utveckling/sakkunniggrupper/hta-skane/#110365	Browsat		0
Vetenskapliga rådet, Region Dalarna https://www.regiondalarna.se/plus/forskning-och-innovation/vetenskapliga-radet/	Browsat		0

Citation searching

A backwards and forwards citation search in Web of Science, 17 Mar 2026, resulted in 166 records after deduplication. Systematic reviews assessed for eligibility in this report were used as seed references.

Articles used in backwards citation searching

Bonanni G, Lopez MC, Tarchi SM, Abiad M, Shantz C, Bevilacqua E, et al. Postpartum Hemorrhage in Patients With a Low-Lying Placenta: A Systematic Review and Meta-analysis. 2025:10.1097/aog.0000000000005956.

Jansen C, de Mooij YM, Blomaard CM, Derks JB, van Leeuwen E, Limpens J, et al. Vaginal delivery in women with a low-lying placenta: a systematic review and meta-analysis. 2019a:1118-26.

Jansen C, Kleinrouweler CE, van Leeuwen L, Ruiter L, Limpens J, van Wely M, et al. Final outcome of a second trimester low-positioned placenta: A systematic review and meta-analysis. 2019b:197-204.

Matsuzaki S, Ueda Y, Matsuzaki S, Sakaguchi H, Kakuda M, Lee M, et al. Relationship between Abnormal Placenta and Obstetric Outcomes: A Meta-Analysis. 2023.

Reference lists

Included reports

Ornaghi S, Vaglio Tessitore I, Vergani P. Pregnancy and Delivery Outcomes in Women With Persistent Versus Resolved Low-Lying Placenta in the Late Third Trimester. J Ultrasound Med. 2022;41(1):123-33. doi: https://doi.org/10.1002/jum.15687.

Taga A, Sato Y, Sakae C, Satake Y, Emoto I, Maruyama S, et al. Planned vaginal delivery versus planned cesarean delivery in cases of low-lying placenta. J Matern Fetal Neonatal Med. 2017;30(5):618-22. doi: https://doi.org/10.1080/14767058.2016.1181168.

Yamamoto H, Yamawaki K, Haino K, Yoshihara K, Nishijima K. Influence of Warning Bleeding on Blood Loss in Low-Lying Placenta. Cureus. 2024;16(11):e74858. doi: https://doi.org/10.7759/cureus.74858.

Systematic reviews, only commented on:

Jansen C, de Mooij YM, Blomaard CM, Derks JB, van Leeuwen E, Limpens J, et al. Vaginal delivery in women with a low-lying placenta: a systematic review and meta-analysis. BJOG. 2019a;126(9):1118-26. doi: https://doi.org/10.1111/1471-0528.15622.

Excluded reports

Abduljabbar HS, Bahkali NM, Al-Basri SF, Al Hachim E, Shoudary IH, Dause WR, et al. Placenta previa. A 13 years experience at a tertiary care center in Western Saudi Arabia. Saudi Med J. 2016;37(7):762-6. doi: https://doi.org/10.15537/smj.2016.7.13259.

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Project: Low-lying placenta

Appendix 2 – Included studies

Author Year Country	Study Design	Length of Follow-Up	Study Groups; Intervention vs control	Patients (n)	Population characteristics	Inclusion/ exclusion criteria	Outcome variables
Ornaghi, 2022, Italy	Single center Prospective cohort	28-30 weeks gestation to birth	I: Planned vaginal birth (n=62) C: Planned Caesarean section (n=24) Persisting vs resolved low-lying placenta with subgroups according to IOD 1. 1-10 mm: 15/86 2. 11-20mm: 50/86 3. >20mm: 21/86 All patients within group 1 were recommended C section, while all members in group 2-3 were recommended vaginal birth	86	IOD: patients were grouped according to last TVS before delivery Age: 1. 33.7±5.6 2. 34.5 ±4.8 3. 35.0±7.2 (p=0.798) Previous C section: 1. 4/15 2. 4/50 3. 1/21 (p=0.072) Nullipara: 1. 11/15 (73%) 2. 20/50 (40%) 3. 11/21 (52%) (p=0.72) Gestation age at birth: 1. 38.0±1.6 2. 38.6±2.4 3. 39.3±1.7 (p=0.114)	Inclusion: Singleton, Low lying placenta at early third trimester ultrasound (28-30 weeks gestation). Exclusion: >28 days between last TVS and birth PAS Vasa previa	Maternal outcomes: -Vaginal birth - Intensive care -Postpartum hysterectomy Neonatal outcomes: - Perinatal mortality - Neonatal intensive care unit
Taga, 2017, Japan	Single center Observational Cohort	From 36 weeks of gestation to birth	I: Planned vaginal birth (n=11) C: Planned Caesarean section (n=7)	18	Age: I: 32.9±1.5 years C: 33.4±1.9 years IOD: I: 8.0 ± 2.2mm, 5/11 <10mm	Inclusion: Low lying placenta (0-20 mm IOD) diagnosed by experienced	Maternal outcomes: -Vaginal birth -Postpartum haemorrhage -Antenatal haemorrhage -Transfusion

Appendix 2 – Included studies

Author Year Country	Study Design	Length of Follow-Up	Study Groups; Intervention vs control	Patients (n)	Population characteristics	Inclusion/ exclusion criteria	Outcome variables
			Planned mode of birth was decided by the patient		C: 8.3±2.8 mm, 3/7 <10 mm at 36 weeks of gestation. Nullipara: I: 7/11(64%) C: 5/7 (71%) GA at birth: I: 39.5±0.4 weeks, C: 37.5±0.5 weeks	obstetrician at 36 weeks via TVS Exclusion: Previous c section Maternal medical condition PP	Neonatal outcomes: -Neonatal mortality -Umbilical chord arterial pH
Yamamoto, 2024, Japan	Single center Retrospective cohort	From 35-36 weeks gestation to birth	I: Planned vaginal birth C: Planned Caesarean birth Planned birth method was at the discretion of the attending physician and the patient	27	Age: I: 35 (28-41) C: 33 (24-43) IOD: 5/27 <10mm, 20/27≥10mm 2/27 unknown IOD <20mm Previous C section: Included in planned CD group, not allowed to labour Nullipara: 16/27 (59%), GA at birth: 38 (37-41) weeks I: 39 (38-41), C: 37 (37-38)	Inclusion: Singleton, LLP diagnosed through TVS at 35-36 weeks Exclusion: PP, PAS, multiple pregnancies, and women receiving anticoagulation or antiplatelet therapy, and those with abnormal platelet counts or coagulation systems.	Maternal outcomes: -Vaginal birth -Mortality -Postpartum hysterectomy -Postpartum haemorrhage Neonatal outcomes: -Mortality -APGAR score -Umbillical chord arterial pH

Appendix 2 – Included studies

Author Year Country	Study Design	Length of Follow-Up	Study Groups; Intervention vs control	Patients (n)	Population characteristics	Inclusion/ exclusion criteria	Outcome variables
					No significant difference between I and C when comparing age, parity or BMI. No statistics available regarding differences in IOD between I and C. Other comorbidities: C: 1 with severe hypertension, 1 vasa previa, 1 foetal disease		

I: Intervention, C: Comparator, IOD- distance between lover edge of the placenta and the internal cervical os, TVS- transvaginal ultrasound, PAS placenta accreta spectrum, PP placenta previa, LLP low-lying placenta

Project: Low-lying placenta
Appendix 3.
Excluded articles

Author, year	Reason for exclusion
Abduljabbar, 2016	Wrong intervention (caesarean delivery)
Adere, 2020	Wrong population (not low-lying placenta)
ADoPAD, 2024	Mixed population (data on low-lying placenta and term pregnancy not defined)
Adroja, 2024	Mixed population (data on low-lying placenta not defined)
Agrawal, 2024	Mixed population (data on low-lying placenta and term pregnancy not defined)
Ahn, 2018	Mixed population (data on low-lying placenta not defined)
Ahuja, 2024	Mixed population (data on low-lying placenta not defined)
Akram, 2025	Wrong population (not low-lying placenta)
Alchalabi, 2017	Wrong intervention (caesarean delivery)
Alencar Junior, 2012	Wrong language (Portuguese)
Alhubaishi, 2022	Wrong intervention (caesarean delivery)
Alouni, 2020	Wrong population (proportion of premature <37 weeks not known)
Alwan, 2022	Wrong population (not low-lying placenta)
Ari, 2023	Wrong intervention (caesarean delivery)
Ashraf, 2020	Wrong population (not low-lying placenta)
Asicioglu, 2014	Wrong population (not low-lying placenta)
Ayaz, 2012	Wrong intervention (caesarean delivery)
Aziz, 2017	Wrong population (not defined whether population has placenta previa or low-lying placenta)
Balachandar, 2020	Wrong population (to high proportion of premature births, not restricted to singleton)
Balayla, 2015	Wrong population (High proportion of premature births and not defined whether placenta previa och low lying placenta)
Behuria, 2025	Wrong population (wrong definition och placenta previa and low-lying placenta)
Belachew, 2017	Mixed population (data on low-lying placenta not defined)
Bharti, 2024	Wrong focus (no data on low-lying placenta and vaginal delivery)
Bhingare, 2022	Mixed population (data on low-lying placenta not defined)
Bi, 2021	Mixed intervention (data on vaginal delivery not defined)
Bist, 2023	Wrong focus (no data on vaginal delivery)
Bonanni, 2025	Wrong study type and wrong question (systematic review)
Borana, 2025	Mixed population (data on low-lying placenta not defined)
Chandran, 2022	Wrong population (unclear proportion of premature births)
Channana, 2023	Mixed population (data on low-lying placenta not defined)
Charron, 2024	Wrong population (low-lying placenta resolved in third trimester)
Choi, 2023	Wrong intervention (caesarean delivery)
Chung, 2020	Mixed intervention (data on vaginal delivery not defined)
Colciago, 2025a	Wrong population (includes patients with resolved low lying placenta)

Project: Low-lying placenta
Appendix 3.
Excluded articles

Author, year	Reason for exclusion
Colciago, 2025b	Wrong study type, wrong question (Systematic review)
Copland, 2012	Wrong intervention (caesarean delivery)
Curti, 2013	Wrong population (unclear proportion of premature births)
Daskalakis, 2011	Mixed intervention (data on vaginal delivery not defined)
Davood, 2010	Wrong population (not low-lying placenta)
Dev, 2024	Mixed population (data on low-lying placenta not defined)
Devi, 2023	Wrong focus (no data on vaginal delivery)
Dube, 2025	Too few patients
Durukan, 2019	Wrong intervention (caesarean delivery)
Ezveci, 2024	Wrong intervention (caesarean delivery)
Fan, 2017a	Wrong focus (no data on vaginal delivery)
Fan, 2017b	Wrong population (not low-lying placenta)
Farladansky-Gershnabel	Wrong focus (no data on vaginal delivery)
Feng, 2017	Mixed population (data on low-lying placenta not defined)
Froeliger, 2022	Wrong population (too high proportion of premature births, not restricted to singleton)
Gandotra, 2023	Mixed population (data on low-lying placenta and term pregnancy not defined)
Gedik Ozkose, 2022	Wrong intervention (caesarean delivery)
Geidam, 2024	Mixed population (data on low-lying placenta not defined)
Giambattista, 2012	Wrong intervention (caesarean delivery)
Gibbins, 2018	Wrong intervention (caesarean delivery)
Govindaraju, 2024	Wrong intervention (caesarean delivery)
Greenwood, 2023	Wrong focus (resolution of low-lying placenta)
Gronvall, 2019	Too few patients
Hafeez, 2013	Mixed population (data on low-lying placenta not defined)
Hou, 2017	Wrong language (Chinese)
Hu, 2024	Mixed population (data on low-lying placenta and term pregnancy not defined)
Huang, 2022	Wrong focus (no data on vaginal delivery)
Jansen, 2019a	Systematic review not included in results, yet appraised and commented on
Jansen, 2019b	Wrong focus (resolution and migration of low-lying placenta)
Jasmatbhai, 2024	Mixed population (data on low-lying placenta and term pregnancy not defined)
Jindal, 2022	Wrong focus (no data on vaginal delivery)
Jing, 2018	Wrong intervention (caesarean delivery)
Kancherla, 2015	Wrong focus (no data on vaginal delivery)
Kanigalpula, 2022	Wrong intervention (caesarean delivery)
Kilicci, 2017	Wrong population (not low-lying placenta)
Kollmann, 2016	Wrong focus (no data on vaginal delivery)
Kumar, 2024	Wrong focus (no data on vaginal delivery)

Project: Low-lying placenta
Appendix 3.
Excluded articles

Author, year	Reason for exclusion
Kumar, 2023	Wrong focus (no data on vaginal delivery)
Kumari, 2023	Wrong focus (no data on vaginal delivery)
Kumari, 2022	Mixed intervention (data on vaginal delivery not defined)
Lad, 2022	Wrong focus (no data on vaginal delivery)
Lal, 2015	Wrong intervention (caesarean delivery)
Lee, 2017	Wrong intervention (caesarean delivery)
Lee, 2024	Wrong intervention (caesarean delivery)
Luangruangrong, 2013	Wrong focus (no data on vaginal delivery)
Mahmood, 2018	Wrong intervention (caesarean delivery)
Mastrolia, 2016	Mixed population (data on low-lying placenta not defined)
Matsuzaki, 2023	Wrong focus (no data on vaginal delivery)
Naz, 2024	Wrong population (not low-lying placenta)
Norgaard, 2012	Mixed population (data on low-lying placenta not defined)
Ohira, 2012	Too few patients
Omokanye, 2017	Wrong population (Too high proportion of premature births and wrong definition of Placenta previa/Low-lying placenta)
Osmundson, 2013	Mixed intervention (data on vaginal delivery not defined)
Ozer, 2017	Wrong intervention (caesarean delivery)
Ozturk, 2023	Wrong intervention (caesarean delivery)
Pacu, 2022	Wrong focus (no data on vaginal delivery)
Patra, 2024	Wrong focus (no data on vaginal delivery)
Pinton, 2023	Mixed population (data on low-lying placenta not defined)
Pun, 2022	Mixed population (data on low-lying placenta and term pregnancy not defined)
Qing, 2021	Wrong intervention (caesarean delivery)
Rao, 2021	Wrong population (not low-lying placenta)
Rashid, 2013	Wrong intervention (caesarean delivery)
Robinson, 2012	Wrong focus (no data on vaginal delivery)
Rosenberg, 2011	Wrong population (not low-lying placenta)
Roustaei, 2018	Wrong population (not low-lying placenta)
Sabourin, 2012	Wrong focus (no data on low-lying placenta and vaginal delivery)
Sahni, 2022	Wrong focus (no data on vaginal delivery)
Saosakade, 2024	Mixed population (data on low-lying placenta and term pregnancy not defined)
Savitha, 2025	Wrong focus (no data on vaginal delivery)
Schneiderman, 2013	Wrong intervention (caesarean delivery)
Senkoro, 2017	Wrong population (not low-lying placenta)
Siddiqui, 2011	Mixed population (data on low-lying placenta not defined)
Sindiani, 2021	Wrong intervention (caesarean delivery)
Singh, 2024	Wrong population (unclear proportion of premature and unclear when ultrasound was preformed)

Project: Low-lying placenta
Appendix 3.
Excluded articles

Author, year	Reason for exclusion
Soren, 2022	Mixed population (data on low-lying placenta not defined)
Stafford, 2019	Wrong population (not low-lying placenta)
Suknikom, 2011	Mixed population (data on low-lying placenta not defined)
Surabhi, 2025	Mixed intervention (data on vaginal delivery not defined)
Tahseen, 2018	Mixed population (data on low-lying placenta not defined)
Takahashi, 2020	Mixed population (data on low-lying placenta not defined)
Tanwar, 2025	Wrong focus (no data on vaginal delivery)
Tasgoz, 2022	Wrong intervention (caesarean delivery)
Walfisch, 2016	Wrong population (not low-lying placenta)
Weiner, 2016a	Wrong intervention (caesarean delivery)
Weiner, 2016b	Wrong population (not low-lying placenta)
Wortman, 2016	Wrong population (unclear proportion of premature)
Xie, 2021	Mixed population (data on low-lying placenta not defined)
Yadav, 2022	Wrong focus (no data on vaginal delivery)
Zhou, 2022	Wrong intervention (caesarean delivery)
Zlatnik, 2010	Wrong focus (model, no patients)

Project: Low-lying placenta

* + No or minor problems
? Some problems
- Major problems

Appendix 4.1
Outcome variable: Vaginal delivery

Author year country	Study design	Number of patients n=	With-drawals - dropouts	Results		Comments	Directness *	Study limitations *	Precision *
				Intervention (intended vaginal birth)	Control (intended Caesarean section)				
Ornaghi, 2022 Italy	Prospective cohort study	N=86 I= 62 C=24		Trial of labour: 62 Vaginal birth: 49/62 (79%) IOD 1-10: 0/2 (0%) IOD 11-20: 33/43 (77%) IOD 21-30: 16/17 (94%) Emergency caesarean section: 13 IOD 0-10: 1 abnormal fetal tracing, 1 excessive bleeding in first stage of labour IOD 11-20: 7 urgent pre labour due to bleeding 1 brow presentation 1 failure to progress 1 abnormal fetal heart rate IOD >20: 1 pre labour urgent due to bleeding	Planned caesarean section: 24 IOD 0-10: 13 due to LLP* IOD 11-20: 2 Patients request, 5 fetal malpresentation IOD >20:1 herpes genitalis, 1 Fetal macrosomia with maternal gestational diabetes, 1 Breech presentation, 1 maternal psychiatric disease *2 patients had an emergent C section due to bleeding prior to planned surgery	16 out of 86 patients had an IOD >20 mm at final scan	-	-	-
Taga, 2017 Japan	Observational cohort study	N=18 I=11 C=7		Trial of labour: 11 patients Vaginal birth: 8/11 (73%) Emergency caesarean section: 3 All due to uncontrollable antenatal bleeding	Elective caesarean section: 7 All on patient request	6 /11 cases in the intervention group had an IOD ≥20 at final scan. Allocation to I or C based on patient preference	?	-	-
Yamamoto, 2024 Japan	Retrospective cohort study	N=27 I=11 C=16		Trial of labour: 11 patients Vaginal birth: 9/11 (82%) Emergency caesarean section in 2 cases due to labour arrest	Planned caesarean section:16 patients Solely due to low lying placenta:7 Other indications:9 5 previous CS 1 severe gestational hypertension 1 fetal disease 1 marginal sinus 1 vasa previa	Allocation to I or C based on decision of physician and patient	?	-	-

I: Intervention, C: Comparator

Project: Low-lying placenta

* + No or minor problems
? Some problems
- Major problems

Appendix 4.2
Outcome variable: Maternal mortality

Author year country	Study design	Number of patients n=	Withdrawals - dropouts	Results		Comments	Directness *	Study limitations *	Precision *
				Intervention (intended vaginal birth)	Control (intended Caesarean section)				
Yamamoto, 2024 Japan	Retrospective cohort	N=27 I=11 C=16		0/11	0/16		?	-	-

I: intervention, C: Comparator

Project: Low-lying placenta

*	+ No or minor problems
	? Some problems
	- Major problems

Appendix 4.3
Outcome variable: Need of intensive care (mother)

Author year country	Study design	Number of patients n=	Withdrawals - dropouts	Results		Comments	Directness *	Study limitations *	Precision *
				Intervention (intended vaginal birth)	Control (intended Caesarean section)				
Ornaghi, 2022 Italy	Prospective cohort	N=86 I=62 C=24		0/62	0/24		-	-	-

I: Intervention, C: Comparator

Project: Low-lying placenta

*	+ No or minor problems
	? Some problems
	- Major problems

Appendix 4.4
Outcome variable: Emergency interventions due to postpartum haemorrhage (e.g. Hysterectomy, uterine ballone tamponade, embolisation)

Author year country	Study design	Number of patients n=	Withdrawals - dropouts	Results		Comments	Directness *	Study limitations *	Precision *
				Intervention (intended vaginal birth)	Control (intended Caesarean section)				
Ornaghi, 2022 Italy	Prospective cohort	N=86 I=62 C=24		0/62	0/24	No delayed postpartum hysterectomy	-	-	-
Yamamoto, 2024 Japan	Retrospective cohort	N=27 I=11 C=16		0/11	0/16	No obstetric hysterectomy	?	-	-

I: Intervention, C: Comparator

Project: Low-lying placenta

* + No or minor problems
? Some problems
- Major problems

Appendix 4.5
Outcome variable: Postpartum haemorrhage ≥1000 ml

Author year country	Study design	Number of patients n=	Withdrawals - dropouts	Results		Comments	Directness *	Study limitations *	Precision *
				Intervention (intended vaginal birth)	Control (intended Caesarean section)				
Ornaghi, 2022 Italy	Prospective cohort	N=86 I=62 C=24		PPH ≥1000 ml 8/62 (13%)	PPH ≥1000 ml 7/24 (29%)	Nonpublished data. Results by intended mode of birth received upon request from the authors, as the publication only presents results based on actual mode of birth)	-	-	-
Taga, 2017 Japan	Observational cohort	N=18 I=11 C=7		Intrapartum blood loss ≥1000 ml 4/11 (36%)	Intrapartum blood loss ≥1000 ml 7/7 (100%)	Note, for vaginal delivery bleedings up to 2 hours after birth were included. Note, the publication presents results in terms of PPH ≥1500 g. Presented data on PPH ≥1000 ml are nonpublished data, from correspondence with authors.	?	-	-
Yamamoto, 2024 Japan	Retrospective cohort	N=27 I=11 C=16		Abnormal haemorrhage 4/11 (36%)	Abnormal haemorrhage 3/16 (19%)	Abnormal bleeding defined as I: 800 ml or more C: 1500 ml or more Note, for vaginal delivery bleedings up to 2 hours after birth were included	?	-	-

I: Intervention, C: Comparator

Project: Low-lying placenta

* + No or minor problems
? Some problems
- Major problems

Appendix 4.6
Outcome variable: Neonatal mortality and perinatal mortality

Author year country	Study design	Number of patients n=	Withdrawals - dropouts	Results		Comments	Directness *	Study limitations *	Precision *
				Intervention (intended vaginal birth)	Control (intended Caesarean section)				
Neonatal mortality									
Taga, 2017 Japan	Observational cohort	N=18 I=11 C=7		0/11	0/7	No serious neonatal complications	?	-	-
Yamamoto, 2024 Japan	Retrospective cohort	N=27 I=11 C=16		0/11	0/16		?	-	-
Perinatal mortality									
Ornaghi, 2022 Italy	Prospective cohort	N=86 I=62 C=24		0/62	0/24		-	-	-

I: Intervention, C: Comparator

Project: Low-lying placenta

* + No or minor problems
? Some problems
- Major problems

Appendix 4.7
Outcome variable: Apgar score

Author year country	Study design	Number of patients n=	Withdrawals - dropouts	Results		Comments	Directness *	Study limitations *	Precision
				Intervention (intended vaginal birth)	Control (intended Caesarean section)				
Yamamoto, 2024 Japan	Retrospective cohort	N=27 I=11 C=16		0/ 11	0 / 16	Number of cases with Apgar score <4 after 5 minutes	?	-	-

I: Intervention, C: Comparator

Project: Low-lying placenta

* + No or minor problems
? Some problems
- Major problems

Appendix 4.8
Outcome variable: Antenatal haemorrhage

Author year country	Study design	Number of patients n=	Withdrawals - dropouts	Results		Comments	Directness *	Study limitations *	Precision *
				Intervention (intended vaginal birth)	Control (intended Caesarean section)				
Taga, 2017 Japan	Observational cohort	N=18 I=11 C=7		3/11 (27%)	0/7 (0%)	3 out of 11 TOL required emergency C section due to uncontrollable antepartum bleeding, not clarified if this was after onset of labour	?	-	-
Yamamoto, 2024 Japan	Retrospective cohort	N=27 I=11 C=16		2/11 (18%)	4/16 (25%)	Defined as warning bleeding	?	-	-

I: Intervention, C: Comparator

Project: Low-lying placenta

* + No or minor problems
? Some problems
- Major problems

Appendix 4.9
Outcome variable: Blood transfusion

Author year country	Study design	Number of patients n=	Withdrawals - dropouts	Results		Comments	Directness *	Study limitations *	Precision *
				Intervention (intended vaginal birth)	Control (intended Caesarean section)				
Taga, 2017 Japan	Observational cohort	N=18 I=11 C=7		0/11 (0%	1/7 (14%)	Homologus bloodtransfusion	?	-	-

I: Intervention, C: Comparator

Project: Low-lying placenta

* + No or minor problems
? Some problems
- Major problems

Appendix 4.10
Outcome variable: Postpartum haemorrhage ≥ 500 ml

Author year country	Study design	Number of patients n=	Withdrawals - dropouts	Results		Comments	Directness *	Study limitations *	Precision *
				Intervention (intended vaginal birth)	Control (intended Caesarean section)				
Taga, 2017 Japan	Observational cohort	N=18 I=11 C=7		7/11 (64%)	7/7 (100%)	Nonpublished data, collected through correspondence with authors	?	-	-

I: Intervention, C: Comparator

Project: Low-lying placenta

* + No or minor problems
? Some problems
- Major problems

Appendix 4.11
Outcome variable: Umbilical cord arterial pH

Author year country	Study design	Number of patients n=	Withdrawals - dropouts	Results		Comments	Directness *	Study limitations *	Precision *
				Intervention (intended vaginal birth)	Control (intended Caesarean section)				
Taga, 2017 Japan	Observational cohort	N=18 I=11 C=7		7.249±0.016 (7.191-7.336)	7.260±0.031 (7.230-7.313)	Mean ± standard error (range) P=0.763	?	-	-
Yamamoto, 2024 Japan	Retrospective cohort	N=27 I=11 C=16		7.32 (7.20-7.44)	7.32 (7.12-7.38)	Median (range) P=0.75	?	-	-

I: Intervention, C: Comparator

Project: Low lying placenta

Appendix 5 Critical appraisal of included studies

Aspects regarding directness and study limitations contributing to categorisation as no/minor (+), some (?) or major (-) problems.

Author Year Country Study design	**Problems contributing to downgrading the study in the assessment**			
	Directness[1]		**Risk of bias[2]**	
Ornaghi, 2022 Italy	-	• Screened population not described, • I and C not clearly corresponding to our PICO as the plan is linked to the distance from IOS (patients with distance 1-10 mm not offered trial of labour), • Several cases of breech presentation among the included patients • Italy has overall a higher CS rate, • In the population too many cases with vasa previa are described (although these were excluded from this study)	-	• Groups differ regarding previous CS and parity. • For PPH - some concern regarding the measurement of PPH, • Note – for several results in the publication, there are concerns as the evaluation as CS or VD is based on actual rather than planned mode of delivery. However, in the present analysis only results in terms of the intended mode of delivery were used.
Taga, 2017 Japan	?	• Correspondence of the setting in Japan and in Sweden (e.g. differing degree to which CS is used in different Japanese hospitals)? • Patients with previous CS excluded	-	• Patients themselves chose allocation to treatment group. • Limited information on baseline characteristics, • CS at 37-38 weeks, earlier than vaginal delivery which may affect neonatal outcomes, • some unclarity regarding measurement of bleeding.
Yamamoto, 2024 Japan	?	• Old study in Japan implying eventual difference from current setting in Sweden. • Unclear how the population is chosen from the patient population at the hospital, • Population not completely corresponding to our PICO (e.g. one patient with term breech presentation included),	-	• Physician and patient choose the way of delivery, • Baseline differences between groups (e.g. 9 patients who were planned for CS and would not be candidate for vaginal delivery). • Different /unclear method for assessing blood volume, no protocol, of the planned outcomes only very few are presented.

[1] Assessed using the checklist developed by HTA-centrum: no/minor (+), some (?), or major (-) problems

[2] Assessed using the checklist developed Cochrane: no/minor (+), some (?), or major (-) problems