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Digital Video Education for Maternal Awareness of Neonatal Asphyxia Risk Factors

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ABSTRACT

Introduction *Neonatal asphyxia is a contributor to adverse neonatal outcomes, while maternal knowledge of its associated risk factors remains inadequate. Video-based digital health education offers an accessible approach, but evidence regarding its effectiveness in improving maternal knowledge remains limited. To synthesize evidence on video-based health education and its potential to improve pregnant women's knowledge, awareness, engagement, and preparedness in recognizing risk factors associated with neonatal asphyxia.*

Methods *This systematic review followed the PRISMA 2020 framework. Searches were conducted in Google Scholar, PubMed, Scopus, and ScienceDirect during May–June 2026 for studies published between 2020 and 2026. Eligible studies evaluated video-based educational interventions or investigated risk factors associated with neonatal asphyxia. Methodological quality was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist, and evidence was synthesized narratively and thematically.*

Results *Of 72 records identified, 30 studies met the eligibility criteria. Twenty evaluated video-based educational interventions and 10 examined neonatal asphyxia risk factors. The evidence comprised 3 randomized controlled trials, 7 quasi-experimental studies, 8 systematic reviews/meta-analyses, 2 qualitative studies, and 10 other designs. JBI appraisal was applicable to 28 studies: 27 (96.4%) were rated high quality and 1 (3.6%) moderate quality. Four themes emerged: intervention characteristics, maternal knowledge, maternal engagement and learning experience, and implications for neonatal asphyxia risk prevention.*

Conclusion *Video-based health education is a promising complementary strategy for improving maternal knowledge, awareness, engagement, and preparedness regarding neonatal asphyxia risk factors. However, heterogeneity in study designs and outcomes limits direct comparison, and evidence on direct neonatal outcomes remains limited.*

Keywords: *birth asphyxia, health education, pregnancy, digital education, maternal health*

INTRODUCTION

According to the United Nations Inter-agency Group for Child Mortality Estimation [1], approximately 4.8 million children died before reaching five years of age in 2023, including 2.3 million neonatal deaths, indicating that nearly half of all under-five deaths occurred during the neonatal period. Most of these deaths resulted from preventable causes and disproportionately affected low- and middle-income countries, where access to quality maternal and newborn healthcare remains limited. The World Health Organization [2] identifies birth asphyxia and other intrapartum-related complications as major contributors to neonatal mortality worldwide. Neonatal asphyxia remains one of the leading causes of neonatal morbidity and mortality and is defined as the failure of a newborn to initiate and maintain adequate breathing at birth, resulting in insufficient oxygen supply to vital organs and potentially causing severe neurological impairment or death [3]. Recent evidence has identified several maternal, fetal, and intrapartum risk factors associated with neonatal asphyxia, including hypertensive disorders during pregnancy, prolonged labor, premature rupture of membranes, prematurity, low birth weight, and inadequate antenatal care [4]. Because many of these risk factors can be identified or monitored during antenatal care, maternal knowledge is important for recognizing potential risks and seeking timely healthcare. Inadequate knowledge may contribute to delayed recognition of danger signs and delayed referral when complications occur, highlighting the need for effective maternal health education during pregnancy.

Maternal knowledge is an important factor in determining health-seeking practices and shaping health outcomes during pregnancy [5]. Adequate knowledge may enable pregnant women to better interpret physiological changes and identify warning signs, make informed health-related decisions, appropriately utilize antenatal care services, and obtain professional medical assistance when required [6]. A stronger understanding of pregnancy-related risks may also improve maternal risk perception, allowing women to recognize potential complications affecting themselves or their newborns and to judge when healthcare should be sought. Greater awareness of these risks may, in turn, support prompt healthcare-seeking and early referral when danger signs are identified, potentially reducing delays in accessing appropriate care and limiting preventable neonatal complications. Accordingly, health education constitutes an important component of antenatal care, particularly for strengthening maternal health literacy and encouraging positive health behaviors [7]. However, conventional educational methods, including face-to-face lectures, counseling, and printed materials, may be limited by restricted consultation time, inconsistent delivery of

information, and low participant engagement [8]. These constraints may reduce the capacity of educational interventions to enhance maternal comprehension and support the retention of essential health information [9].

The advancement of digital technology has broadened the available means of delivering health education, particularly through media that can provide greater accessibility and interactivity. Video-based education has emerged as one of these approaches because the combination of visual and auditory information may facilitate the comprehension of health messages, reinforce information retention, and promote learner engagement [5]. Educational videos also allow users to review information repeatedly according to their needs and may accommodate individuals with different levels of literacy, potentially supporting the acquisition of health-related knowledge [10]. Previous research has documented improvements in pregnant women's knowledge after receiving video-based education on topics including pregnancy, childbirth preparation, maternal self-care, and newborn care [11]. However, the outcomes of such interventions may be influenced by characteristics of both the intervention and its implementation context, including content quality and duration, delivery platform, participants' digital literacy, access to internet-enabled devices, and cultural and contextual factors. These conditions may affect women's ability to access, understand, engage with, and retain the information provided. Evidence from antenatal education also suggests that digital interventions may support improvements in health literacy and positive health-related behaviors among pregnant women [12]. Accordingly, the potential benefits of video-based education should be interpreted in relation to the specific features of the intervention and the context in which it is implemented, rather than independently of these factors.

Previous research suggests that video-based educational interventions may improve maternal knowledge across diverse areas of maternal and newborn health, including pregnancy complications, preterm birth prevention, childbirth preparation, maternal self-care, and newborn care [10]. Studies have also reported associations between these interventions and improved maternal and newborn health knowledge, increased learner engagement, and enhanced health literacy among pregnant women [6]. Similarly, other forms of digital education have shown potential to support maternal learning outcomes and promote positive health-related behavioral changes [13]. However, the existing literature has predominantly focused on maternal health education in general or on specific educational topics, with comparatively limited evidence addressing the relationship between maternal education and knowledge of neonatal asphyxia risk factors [14]. In addition, although various digital and video-based educational approaches have been examined, their findings have not been

systematically synthesized according to intervention characteristics, maternal knowledge outcomes, engagement, preparedness, and their potential relevance to neonatal asphyxia risk prevention [15]. This leaves an important evidence gap concerning how video-based health education may support pregnant women's ability to recognize neonatal asphyxia risk factors, develop appropriate preparedness, and respond to potential risks. Accordingly, this literature review aimed to synthesize evidence on the characteristics and effectiveness of video-based health education in supporting pregnant women's knowledge, awareness, engagement, and preparedness related to neonatal asphyxia risk factors.

METHODS

Study Design

A systematic review methodology was adopted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. The review followed a structured and transparent process encompassing the identification, screening, critical appraisal, data extraction, and synthesis of evidence related to video-based health education, maternal knowledge, and neonatal asphyxia risk factors. The review protocol was not prospectively registered in PROSPERO.

Search Strategy and Information Sources

The literature search encompassed four electronic databases—Google Scholar, PubMed, Scopus, and ScienceDirect—to obtain evidence from complementary fields relevant to biomedical research, maternal health, health education, digital health, pregnancy care, and neonatal health. The search focused on studies published from 2020 to 2026 and was carried out during May–June 2026, with the final database search completed on 2 July 2026.

A comprehensive search strategy was constructed by integrating controlled vocabulary with free-text terms corresponding to the primary concepts of the review. Related terms were combined using the Boolean operators AND and OR to refine the search and maximize the retrieval of potentially relevant literature. The principal concepts comprised pregnant women, video-based health education, maternal knowledge or awareness, and neonatal or birth asphyxia. Because database interfaces and indexing systems differ, the search strategy was adapted accordingly for each source. In PubMed, Medical Subject Headings (MeSH) and Title/Abstract fields were used where appropriate, while equivalent keyword-based or field-specific searches were conducted in Scopus, ScienceDirect, and Google Scholar. The core search expression was: ("pregnant women" OR "antenatal mothers" OR "expectant mothers") AND ("video education" OR "video-based education" OR

"educational video" OR "animated video") AND ("knowledge" OR "awareness" OR "understanding") AND ("neonatal asphyxia" OR "birth asphyxia" OR "newborn health"). To supplement the electronic database search, the reference lists of relevant articles were also manually examined for additional studies that could potentially meet the eligibility criteria.

Database Selection

Google Scholar, PubMed, Scopus, and ScienceDirect were selected because together they provide broad coverage of biomedical, maternal and neonatal health, nursing and midwifery, health education, digital health, and multidisciplinary research. Web of Science, Embase, and CINAHL were not included because the search was restricted to the selected databases that provided broad and complementary coverage relevant to the research objectives and were available for the review.

Eligibility Criteria

PICOS	Criteria
Population	Pregnant women/antenatal mothers and maternal or neonatal populations relevant to neonatal asphyxia risk factors
Intervention/Exposure	Video-based health education, including educational videos, animated videos, smartphone-based videos, films, and digital video learning; studies investigating neonatal asphyxia risk factors were also eligible
Comparator	Usual antenatal care, conventional education, counseling, leaflet/printed education, alternative educational media, or other comparator groups when reported; no comparator was required for qualitative, observational, developmental, or review studies
Outcomes	Maternal knowledge, awareness, understanding, engagement, learning outcomes, preparedness, health-related behavior, and neonatal asphyxia or associated risk factors
Study Design	Randomized controlled trials, quasi-experimental, qualitative, cohort, case-control, cross-sectional, research and development, narrative reviews, and systematic reviews/meta-analyses relevant to the review question

Studies were included if they met the predefined eligibility criteria, were available in full text, were published in English, and were published between 2020 and 2026. Studies were excluded if they were duplicates, conference abstracts without full papers, editorials, commentaries, letters to the editor, inaccessible full-text reports, studies focusing exclusively on healthcare professionals, or studies that did not address the relevant educational or neonatal asphyxia risk-factor outcomes.

Study Selection

Study selection was independently conducted by two reviewers using the predefined eligibility criteria. Titles and abstracts were screened independently, followed by full-text assessment of potentially eligible reports. Disagreements between reviewers were resolved

through discussion and consensus. No third-reviewer adjudication was used. Formal inter-rater reliability statistics, such as Cohen's kappa, were not calculated.

The study selection process followed the PRISMA 2020 framework. A total of 72 records were identified through database searching, comprising Google Scholar (n = 32), PubMed (n = 15), Scopus (n = 13), and ScienceDirect (n = 12). After removal of 7 duplicate records, 65 records remained for title and abstract screening. Thirty-five records were excluded during title and abstract screening because they did not meet the predefined eligibility criteria or were not relevant to the review objective. The remaining 30 reports were retrieved and assessed for full-text eligibility. No reports were excluded at the full-text stage because all 30 reports met the predefined eligibility criteria and were therefore included in the final synthesis. The study selection process is presented in Figure 1.

Quality Appraisal

The methodological quality of the included studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist appropriate to each study design. The relevant JBI checklist was selected according to the methodological design of each study. The appraisal considered the methodological rigor and potential sources of bias relevant to each study design.

For descriptive reporting, the number of checklist items meeting the appraisal criteria was recorded for each study. Percentage values, where presented in the appraisal table, were used only as descriptive summaries and were not considered an official JBI scoring system or a validated JBI threshold. Studies for which no appropriate JBI Critical Appraisal Checklist was available, including narrative reviews and research and development studies, were not formally appraised using the JBI instrument. The appraisal findings were considered during the synthesis of the evidence.

Data Extraction

Data extraction was performed using a standardized extraction form developed by the researchers. Extracted information included author(s), publication year, country, study design, study objectives, participant characteristics, intervention or exposure characteristics, comparator when applicable, outcome measures, intervention duration when reported, and key findings. The extracted data were organized systematically to facilitate comparison across studies and synthesis of the available evidence. Data discrepancies were resolved through discussion and consensus between the reviewers.

Narrative and Thematic Synthesis

Because the included studies differed substantially in methodological design,

intervention characteristics, outcomes, and measurement approaches, statistical meta-analysis was not performed. The findings were synthesized using a structured narrative and thematic synthesis. The synthesis involved four stages: (1) familiarization with the extracted findings, (2) coding of relevant findings, (3) grouping similar findings into preliminary categories, and (4) refinement and interpretation of the categories into overarching themes. The synthesis focused on intervention characteristics, maternal knowledge outcomes, maternal engagement and learning experiences, and implications for neonatal asphyxia risk prevention. Four major themes were subsequently developed and presented in the Results section.

Publication Bias and Certainty of Evidence

Publication bias was not formally assessed because the included studies were heterogeneous in design and outcomes and the review did not perform a quantitative meta-analysis. Funnel plots and statistical tests for publication bias were therefore not considered appropriate. The certainty of evidence was also not assessed using the GRADE framework because the review included multiple study designs and synthesized the findings narratively rather than quantitatively. These methodological considerations are acknowledged as limitations of the review.

The synthesized findings are presented in the Results section across four overarching themes. Figure 1 provides a PRISMA 2020 flow diagram illustrating the process followed to identify and select the studies included in the review.

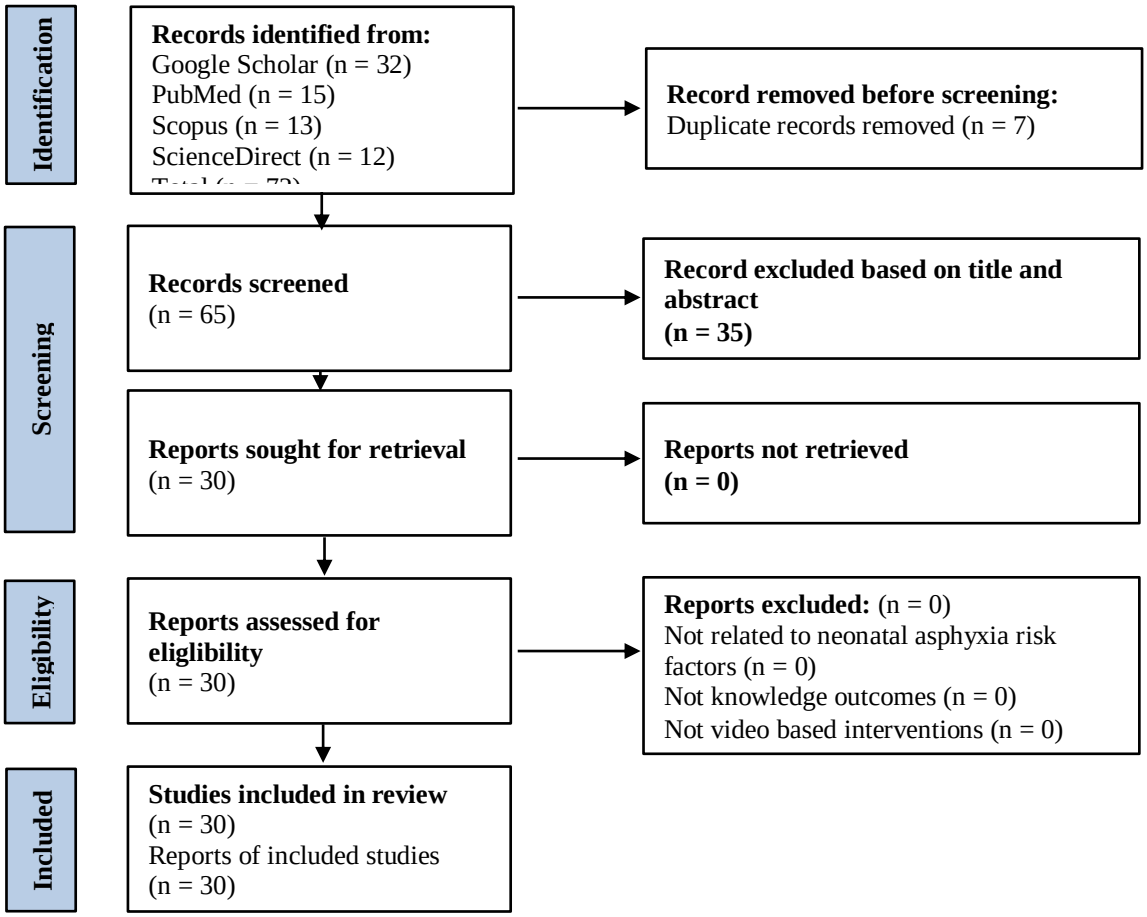


Figure 1. Study identification and inclusion process (PRISMA flow chart)

RESULTS

Characteristics of Included Studies

The database search initially identified 72 records. After seven duplicate records were removed, the remaining 65 records underwent title and abstract screening, during which 35 were excluded. Thirty articles subsequently proceeded to full-text eligibility assessment and were retained for the final synthesis. Of these, 28 studies underwent methodological quality assessment using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist. The remaining two studies were not formally appraised because no corresponding JBI checklist was available for their respective study designs. Both studies were nevertheless retained because they met the predefined eligibility criteria and contributed relevant evidence to the synthesis.

The 30 studies included in this review employed a wide range of methodological approaches. Seven studies used quasi-experimental designs, three were randomized controlled trials, one was a clinical trial, and one was a secondary analysis of an RCT. The remaining studies comprised systematic reviews and meta-analyses, qualitative studies,

cohort, case-control, cross-sectional, mixed-methods, pre–post intervention, experimental, research and development, and narrative review designs. The evidence was also geographically diverse, with studies conducted across several regions, while Indonesia and Ethiopia represented the most frequently occurring settings.

The studies were organized into two evidence groups: 20 studies evaluating video-based educational interventions and 10 studies investigating neonatal asphyxia risk factors. The intervention studies encompassed animated videos, educational films, smartphone-based videos, YouTube-based education, and other digital video formats. Educational videos were associated with improvements in maternal and newborn health knowledge [5]. Similar improvements were reported in maternal knowledge following video-based childbirth education [16]. Smartphone-based video education was also used to improve maternal understanding of pregnancy-related health information [6]. Video-based educational media were additionally developed to improve maternal knowledge regarding preeclampsia [17].

The neonatal asphyxia studies primarily examined maternal, fetal, obstetric, and intrapartum determinants. Evidence from the included review literature identified multiple maternal and neonatal factors associated with neonatal asphyxia [3]. Systematic evidence similarly identified maternal and intrapartum complications as important predictors of neonatal asphyxia [18]. Sample sizes among primary intervention studies ranged from 41 to 229 participants, while studies addressing neonatal asphyxia included substantially larger samples or multiple studies depending on their design.

Table 1A. Characteristics of Studies Evaluating Video-Based Educational Interventions

No	Author (Year)	Country	Research Design	Sample	Main Findings
1	Aprilia et al. (2023)	Indonesia	Quasi-experimental	108 primigravida women	Improved maternal childbirth preparation knowledge
2	Boynito et al. (2023)	Ethiopia	Qualitative Study	41 participants	Feasible and acceptable maternal health education
3	Calvert et al. (2021)	United Kingdom	Randomized Controlled Trial	103 pregnant women	Improved maternal knowledge and preventive behaviors
4	Chaudhary et al. (2023)	Nepal	Randomized Controlled Trial	229 pregnant women	Improved maternal postnatal care knowledge.
5	El-shrqawy et al. (2024)	Egypt	Quasi-experimental	140 pregnant women	Improved childbirth knowledge and attitudes
6	Flynn et al. (2023)	United States	Clinical Trial	120 pregnant women	Improved understanding of preterm birth prevention
7	Hasim et al.	Indonesia	Quasi-	63 pregnant	Increased maternal health

	(2023)		experimental	women	knowledge
8	Jeong et al. (2025)	South Korea	Quasi-experimental	72 pregnant women	Improved health awareness and engagement
9	Kim et al. (2026)	South Korea	Systematic Review and Meta-analysis	Multiple studies	Improved maternal knowledge outcomes
10	Lewa et al. (2022)	Indonesia	Quasi-experimental	56 pregnant women	Improved maternal nutritional knowledge
11	Maharjan et al. (2022)	Nepal	Pre–Post Intervention Study	101 pregnant women	Improved maternal and newborn health knowledge
12	McDonnell et al. (2023)	United States	Secondary Analysis of RCT	Pregnant women	Enhanced neonatal health and resuscitation understanding
13	Morgado et al. (2024)	Multinational	Systematic Review	40 studies	Improved knowledge retention and engagement
14	Nintao et al. (2023)	Thailand	Randomized Controlled Trial	165 pregnant women	Improved prenatal screening knowledge
15	Nurbaiti & Sari (2025)	Indonesia	Research and Development	100 pregnant women	Increased maternal preeclampsia knowledge
16	Ravintaran et al. (2023)	Malaysia	Quasi-experimental	51 pregnant women	Improved understanding of prenatal ultrasound safety
17	Sarabi et al. (2024)	Iran	Quasi-experimental	84 primiparous women	Improved knowledge and preventive behaviors
18	Sutrisminah et al. (2023)	Indonesia	Experimental Study	Primigravida mothers	Improved childbirth preparedness
19	Vandrevala et al. (2024)	United Kingdom	Qualitative Study	Pregnant women and healthcare providers	Feasible and acceptable antenatal education
20	Whitworth et al. (2024)	United Kingdom	Mixed-Methods Study	Pregnant women	Enhanced engagement and learning experiences

Table 1B. Characteristics of Studies Investigating Neonatal Asphyxia Risk Factors

No	Author (Year)	Country	Research Design	Sample	Main Findings
1	Chakkarapani et al. (2025)	International	Narrative Review	Multiple studies	Identified maternal and neonatal risk factors
2	Ketema et al. (2020)	Ethiopia	Systematic Review and Meta-analysis	20 studies	Improved birth preparedness and complication readiness
3	Msisiri et al. (2024)	Tanzania	Case-Control Study	400 neonates	Identified maternal and labor-related determinants
4	Suartiningsih et al. (2025)	Indonesia	Systematic Review	13 studies	Identified maternal, fetal, and intrapartum factors
5	Policarpo	Brazil	Cohort	480 mothers	Associated with maternal and

	Barreto et al. (2025)		Study		obstetric complications
6	Su et al. (2024)	China	Systematic Review and Meta-analysis	80 studies	Identified multiple neonatal asphyxia determinants
7	Tadesse et al. (2022)	Ethiopia	Systematic Review	Observational studies	Identified determinants in low-resource settings
8	Tarko et al. (2024)	Ethiopia	Cross-sectional Study	343 mother–newborn pairs	Obstetric complications associated with birth asphyxia
9	Wang et al. (2025)	China	Systematic Review and Meta-analysis	Multiple studies	Maternal and intrapartum predictors identified
10	Worke et al. (2025)	Ethiopia	Systematic Review & Meta-analysis	Mothers and newborns	Maternal complications increased neonatal asphyxia risk

Quality Assessment of Included Studies

The methodological quality of the included studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist according to the respective study designs. The appraisal process evaluated methodological rigor, participant selection, validity of outcome measurements, management of confounding factors, data collection procedures, and reporting quality.

Of the 30 included studies, 28 were eligible for appraisal using the JBI Critical Appraisal Checklist. Two studies were not subjected to formal JBI assessment because no corresponding JBI critical appraisal instrument was available for their study designs. These studies consisted of one Research and Development (R&D) study [17] and one narrative review [3].

Assessment of methodological quality showed that high-quality studies constituted the vast majority of those formally appraised. Of the 28 studies assessed, 27 (96.4%) received a high-quality rating, while 1 study (3.6%) was considered to be of moderate quality. No assessed study was classified as low quality.

Most of the included studies adequately fulfilled the JBI appraisal criteria, indicating overall methodological rigor and a relatively low risk of bias. Frequently observed methodological strengths included well-defined research objectives, appropriate study designs, suitable participant selection procedures, valid and reliable measurement approaches, and sufficiently comprehensive reporting of study findings. Taken together, these findings suggest that the evidence included in the synthesis was predominantly based on studies with

high methodological quality, which supports the reliability and credibility of the findings presented in this review. A summary of the methodological quality assessment is provided in Table 2.

Table 2. Individual Methodological Quality Assessment of Included Studies Using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist

No	Author (Year)	Study Design	JBI Score	Percentage (%)	Quality Category
1	Aprilia (2023)	Quasi-Experimental	9/9	100.0	High
2	Boynito et al. (2023)	Qualitative	8/10	80.0	High
3	Calvert et al. (2021)	Randomized Controlled Trial	11/13	84.6	High
4	Chakkarapani et al. (2025)	Narrative Review	N/A	N/A	Not Appraised
5	Chaudhary et al. (2023)	Randomized Controlled Trial	10/13	76.9	Moderate
6	El-shrqawy et al. (2024)	Quasi-Experimental	9/9	100.0	High
7	Flynn et al. (2023)	Randomized Controlled Trial	11/13	84.6	High
8	Hasim et al. (2023)	Quasi-Experimental	9/9	100.0	High
9	Jeong et al. (2025)	Quasi-Experimental	9/9	100.0	High
10	Ketema et al. (2020)	Systematic Review & Meta-analysis	10/11	90.9	High
11	Kim et al. (2026)	Systematic Review & Meta-analysis	11/11	100.0	High
12	Lewa et al. (2022)	Quasi-Experimental	9/9	100.0	High
13	Maharjan et al. (2022)	Quasi-Experimental	8/9	88.9	High
14	McDonnell et al. (2024)	Randomized Clinical Trial	11/13	84.6	High
15	Morgado et al. (2024)	Systematic Review & Meta-analysis	11/11	100.0	High
16	Msisiri et al. (2024)	Case-Control	10/10	100.0	High
17	Suartiningsih et al. (2025)	Systematic Review	10/11	90.9	High
18	Nintao et al. (2023)	Randomized Controlled Trial	11/13	84.6	High
19	Nurbaiti & Sari (2025)	Research and Development	N/A	N/A	Not Appraised
20	Barreto et al. (2025)	Cohort	11/11	100.0	High
21	Ravintaran et al. (2023)	Quasi-Experimental	9/9	100.0	High
22	Sarabi et al. (2024)	Quasi-Experimental	9/9	100.0	High
23	Su et al. (2024)	Systematic Review & Meta-analysis	11/11	100.0	High
24	Sutrisminah et al. (2023)	Quasi-Experimental	8/9	88.9	High
25	Tadesse et al. (2022)	Cross-Sectional	8/8	100.0	High
26	Tarko et al. (2024)	Cross-Sectional	8/8	100.0	High
27	Vandrevala et al. (2024)	Qualitative	8/10	80.0	High
28	Wang et al. (2025)	Systematic Review &	11/11	100.0	High

		Meta-analysis			
29	Whitworth et al. (2024)	Qualitative	8/10	80.0	High
30	Worke et al. (2025)	Systematic Review & Meta-analysis	11/11	100.0	High

Table 3. Summary of Methodological Quality Assessment

Category	Number of Studies	Percentage
High Quality	27	96.4%
Moderate Quality	1	3.6%
Low Quality	0	0%
Not Applicable (Narrative Review & R&D)	2	-

Note: Formal methodological appraisal using the JBI Critical Appraisal Checklist was not performed for two studies. One study used a Research and Development (R&D) design (Nurbaiti & Sari, 2025), whereas the other was a narrative review (Chakkarapani et al., 2025). Because no corresponding JBI critical appraisal tool was available for either study design, the quality assessment was limited to the remaining 28 studies.

Synthesis of Findings

Four overarching themes emerged from the narrative synthesis of evidence on video-based health education and neonatal asphyxia risk factors: (1) the characteristics of video-based educational interventions, (2) their effectiveness in enhancing maternal knowledge, (3) maternal engagement and learning experiences, and (4) their implications for preventing neonatal asphyxia risk. Findings were integrated across the included studies by considering intervention characteristics, study designs, reported outcomes, methodological quality, and the consistency of the evidence. Among the 30 included studies, 20 examined video-based educational interventions, whereas 10 focused on neonatal asphyxia and its associated risk factors. Formal methodological appraisal using the JBI Critical Appraisal Checklist was conducted for 28 studies; the remaining two were retained in the synthesis because no corresponding JBI appraisal checklist was available for their respective study designs.

Table 4. Thematic Synthesis of Findings

Theme	Evidence Base and Study Characteristics	Cross-Study Findings	Consistency / Evidence Considerations	Supporting Studies
Characteristics of Video-Based Educational Interventions	20 studies evaluated video-based educational interventions using different delivery formats, including	Considerable variation was observed across the video interventions in terms of their formats, delivery	Across the studies, the findings broadly supported the feasibility and applicability of audiovisual	[5], [7], [13], [19]

	animated videos, educational films, smartphone-based videos, social media, and YouTube.	platforms, and educational content, highlighting the flexibility with which these interventions can be implemented.	approaches despite differences in the characteristics of the interventions.	
Effectiveness in Improving Maternal Knowledge	20 intervention studies examined educational outcomes including knowledge, awareness, understanding, or preparedness.	Most studies reported improvement in maternal knowledge and related educational outcomes following video-based education.	Although the studies generally reported findings in a similar direction, variations in intervention content, duration, outcome measures, and study designs constrained the ability to directly compare the magnitude of effects across studies.	[10], [11], [12], [16], [17], [20]
Maternal Engagement and Learning Experience	Studies assessed engagement, satisfaction, confidence, accessibility, and learning experiences associated with audiovisual education.	Video-based education was associated with greater engagement, satisfaction, confidence, and accessibility of health information.	Findings were generally positive, although the outcomes and assessment approaches varied between studies.	[7], [13], [21], [22]
Implications for Neonatal Asphyxia Risk Prevention	10 studies investigated neonatal asphyxia and associated maternal, fetal, obstetric, and intrapartum risk factors.	Across the reviewed studies, neonatal asphyxia was associated with a range of risk factors, with the findings also offering relevant evidence for strengthening maternal awareness and informing preventive education.	Across the available evidence, neonatal asphyxia risk was consistently characterized as multifactorial. However, the studies largely focused on identifying or examining risk factors rather than evaluating whether video-based education directly influences neonatal outcomes.	[3], [4], [8], [9], [18], [23]

The intervention studies generally reported favorable changes in maternal knowledge, awareness, understanding, and preparedness after exposure to video-based health education. In addition to these learning-related outcomes, several studies described greater maternal participation in educational activities, increased confidence, and improved access to relevant

maternal health information. Video-based interventions were implemented through a range of delivery formats, including animated videos, educational films, smartphone-based videos, social media platforms, and online video programs. However, the reported outcomes were measured and observed to varying degrees across studies, partly because the studies employed different assessment instruments, intervention formats, and methodological designs.

Characteristics of Video-Based Educational Interventions

The included studies used a range of formats and delivery approaches for video-based educational interventions, demonstrating the adaptability of audiovisual media in maternal health education [19]. Despite variation in delivery platforms, educational formats, and implementation settings, the interventions shared the objective of improving pregnant women's understanding of neonatal asphyxia risk factors through educational content designed to be accessible, structured, and user-friendly [5]. Repeated access to video materials may further facilitate comprehension, reinforce retention of health information, and support continued learning across different healthcare environments [7]. The incorporation of digital learning technologies also enhanced the accessibility and practical use of these educational interventions across diverse healthcare contexts [13]. Animation-based and video-assisted approaches, in particular, provided more engaging learning experiences and may encourage active participation during the educational process [24]. Collectively, these findings indicate that video-based educational interventions may offer a practical means of delivering maternal health education while supporting participant engagement and learning outcomes [25].

Effectiveness in Improving Maternal Knowledge

Across the included studies, video-based educational interventions were generally associated with improved maternal knowledge across a broad range of health topics, including pregnancy complications, antenatal care, birth preparedness, newborn care, preeclampsia, nutrition, and preventive health practices. Relative to conventional educational approaches, these interventions generally resulted in higher post-intervention knowledge scores and greater retention of the information provided. The findings suggest that audiovisual learning may represent a useful educational approach for pregnant women [16]. Randomized controlled trials further reported significant gains in maternal knowledge following smartphone-based and video-assisted educational interventions [6]. Comparable findings were observed in studies using animated educational videos for prenatal screening among pregnant women [11]. Video-based antenatal education was also associated with improvements in maternal knowledge, attitudes, and delivery preferences [12]. Similarly,

among primiparous pregnant women, video-based education was associated with improvements in knowledge and preventive self-care [20]. Studies using animated educational media also reported increased maternal knowledge concerning preeclampsia [17]. In addition, educational videos were found to improve maternal knowledge and health-related information among pregnant women experiencing chronic energy deficiency [26].

Maternal Engagement and Learning Experience

Evidence from several studies suggests that video-based education can support greater maternal engagement and more favorable learning experiences. Participants described educational videos as appealing, understandable, and convenient to access [19]. The use of digital platforms also provided greater flexibility in accessing educational materials and facilitated opportunities for self-directed learning [21]. Compared with conventional educational approaches, audiovisual delivery was further associated with higher levels of participant satisfaction and confidence in receiving health-related information [7]. Consistent findings were reported for digital educational interventions, which were associated with enhanced engagement, improved learning experiences, and greater overall satisfaction with antenatal education [13]. Greater engagement and more positive learning experiences may also support maternal preparedness for childbirth and readiness during pregnancy, as reported in previous educational interventions [27].

Implications for Neonatal Asphyxia Risk Prevention

Direct evidence specifically addressing neonatal asphyxia was limited; nevertheless, the available findings consistently indicated improvements in maternal knowledge and awareness of relevant neonatal asphyxia risk factors following video-based educational interventions [28]. Several determinants were identified across the reviewed studies, including hypertensive disorders during pregnancy, prolonged labor, preterm birth, inadequate antenatal care, low birth weight, and maternal complications [29]. Greater maternal awareness of these factors may facilitate earlier recognition of pregnancy-related complications and support timely healthcare-seeking during pregnancy and childbirth [8]. Video-based health education also strengthens maternal preparedness and promotes appropriate preventive behaviors that support neonatal health promotion [4]. Early identification and understanding of neonatal asphyxia risk factors remain essential components of preventive maternal and neonatal healthcare [3]. Maternal understanding of pregnancy-related risk factors further supports comprehensive neonatal health promotion by encouraging appropriate maternal health practices during pregnancy [23]. Multiple maternal, fetal, placental, and intrapartum determinants have been consistently associated with neonatal

asphyxia across different study settings [18]. However, because the included studies primarily evaluated educational outcomes rather than neonatal asphyxia incidence, the current evidence supports improvements in maternal knowledge and preparedness rather than demonstrating a direct reduction in neonatal asphyxia incidence [9]. A cross-sectional study conducted in Ethiopia also reported that prolonged labor, meconium-stained amniotic fluid, and cord accident were significant predictors of birth asphyxia [30].

DISCUSSION

This systematic review synthesized evidence from 30 studies concerning video-based health education and neonatal asphyxia risk factors. The findings demonstrated a predominantly positive pattern of maternal educational outcomes, including improvements in knowledge, awareness, preparedness, and engagement. Maternal knowledge is an important component of health education because adequate knowledge may support pregnant women in recognizing pregnancy-related changes and making appropriate health decisions [5]. Video-based educational interventions have also been reported to improve maternal knowledge and preparedness related to childbirth and maternal health [16]. The potential contribution of maternal knowledge to neonatal health can be understood through a sequence involving knowledge acquisition, risk perception, decision-making, health-seeking behaviour, and timely access to healthcare. Improved understanding of pregnancy-related health information may increase women's ability to recognize warning signs and seek appropriate assistance when necessary [10]. Increased maternal awareness may also support preparedness and confidence in responding to pregnancy-related health problems [17]. However, maternal knowledge alone cannot prevent neonatal asphyxia because the condition is associated with multiple maternal, fetal, and intrapartum factors [3]. Accordingly, video-based education should be viewed as one component of a broader preventive pathway, rather than as a direct intervention for reducing the incidence of neonatal asphyxia.

The potential effectiveness of video-based education may partly stem from its ability to combine visual and auditory elements, enabling health messages to be delivered through multiple sensory channels and potentially supporting both comprehension and retention [11]. Video materials can also organize educational information in a structured and consistent manner, which may make complex maternal and newborn health concepts easier for pregnant women to understand. Another advantage is the opportunity to revisit the same educational content repeatedly. In contrast to conventional counselling, which is generally provided

within a limited consultation period, digital educational resources can be accessed again when needed and according to individual learning preferences [31]. Repeated exposure may reinforce previously delivered information and support continued learning during pregnancy. Video-based interventions may also increase maternal confidence and engagement during the learning process. Educational interventions addressing pregnancy-related health information have demonstrated improvements in maternal knowledge and preventive self-care [20]. Digital prenatal programmes have also been associated with improved engagement and satisfaction among pregnant women [13]. The relationship between video education and maternal behaviour can further be interpreted through the Health Belief Model, in which health behaviour is influenced by perceptions of susceptibility, severity, benefits, and self-efficacy [10]. Within the context of neonatal asphyxia prevention, increased knowledge may strengthen maternal awareness of pregnancy complications and the importance of appropriate preventive behaviours. Improved understanding may subsequently support confidence in recognizing danger signs and seeking appropriate healthcare [17].

The findings of this review are broadly consistent with previous research demonstrating positive effects of video-based education on maternal knowledge. Video-based education has been shown to improve knowledge related to pregnancy and childbirth preparation among pregnant women [16]. Smartphone-based video education has also demonstrated improvements in maternal understanding of pregnancy-related information [10]. Similar findings have been reported in studies using animated educational videos, with interventions associated with improved knowledge among pregnant women regarding pregnancy-related health information [11]. Antenatal education has also been associated with improvements in maternal knowledge and attitudes toward childbirth [12]. The findings concerning maternal engagement are also consistent with previous evidence. Video-based maternal and infant health education has been reported to be acceptable and feasible among pregnant women and community participants [21]. Online antenatal education has similarly demonstrated positive experiences regarding accessibility and learning among women [7].

However, the findings should not be interpreted as demonstrating that all video-based interventions have the same level of effectiveness. Differences in intervention characteristics and study settings may contribute to variation in outcomes [32]. Differences in video duration, educational content, participant characteristics, and digital accessibility may also influence intervention effectiveness [13]. The cultural context in which an intervention is implemented may further influence its effectiveness and acceptability [24]. Educational interventions addressing maternal preparedness may similarly need to consider the social and healthcare

context of pregnant women [25]. These variations indicate that video should not be considered an automatically superior educational medium. Instead, its effectiveness depends on how the intervention is designed, delivered, and adapted to the characteristics of the target population.

The first factor that may influence effectiveness is the quality and relevance of educational content. Information that corresponds to the learning needs of pregnant women may be easier to understand and apply in daily health practices [5]. The second factor is the duration and opportunity for repeated exposure. Digital educational materials provide opportunities for women to review information beyond the antenatal consultation period [31]. The third factor is the delivery platform. The included studies used different approaches, including educational films, smartphone-based videos, social media, and online video programmes [19]. These different platforms provide varying levels of accessibility and engagement [21]. Digital literacy and accessibility may also influence the implementation of video-based education. The effectiveness of digital education may be reduced when pregnant women have limited access to appropriate devices, internet services, or digital resources [7]. Cultural and healthcare-system differences may further influence intervention acceptability and implementation [24]. Therefore, the effectiveness of video-based health education should be understood as the result of interaction between the educational content, delivery method, learner characteristics, and implementation context.

The strength of evidence should be interpreted according to the methodological characteristics of the included studies. Randomized controlled trials provide stronger evidence for evaluating intervention effectiveness because they allow changes in maternal knowledge to be assessed following exposure to the intervention [19]. Quasi-experimental studies also provide evidence regarding changes following educational interventions, although their ability to control for potential confounding factors is generally more limited than randomized designs. Cross-sectional and observational studies primarily contribute evidence concerning associations between maternal characteristics and neonatal asphyxia risk factors. Such designs are useful for identifying potential determinants but cannot establish causal relationships [29]. Qualitative studies provide complementary evidence concerning maternal experiences, perceptions, acceptability, and engagement with video-based education [21]. The combination of quantitative and qualitative evidence therefore provides a broader understanding of both educational outcomes and user experiences. Although findings were generally consistent in direction, methodological heterogeneity limits direct comparison of the strength of evidence. Differences in study design, sample size, measurement instruments, intervention characteristics, and follow-up periods may influence the reported outcomes.

The findings have important implications for antenatal care. Video-based educational interventions may be used as complementary tools for midwives and other healthcare professionals to reinforce maternal and newborn health information during antenatal services [21]. Digital educational materials may also extend access to health information beyond face-to-face consultations, allowing pregnant women to revisit important information according to their individual learning needs [22]. Video-based education should therefore complement rather than replace professional counselling and clinical assessment. Antenatal healthcare providers remain important in assessing individual risk factors, explaining health information, and determining appropriate clinical management. The content of educational videos should emphasize recognizable pregnancy danger signs, neonatal asphyxia risk factors, birth preparedness, and appropriate health-seeking behaviour. Culturally appropriate educational materials may further improve the relevance and acceptability of digital health education [7].

This review has several strengths. The systematic approach allowed evidence from different study designs and healthcare settings to be identified and synthesized. The methodological quality of most included studies was also assessed using appropriate JBI appraisal tools. However, several limitations should be considered. Substantial heterogeneity existed in intervention characteristics, educational content, video duration, delivery platforms, participant characteristics, and outcome measurements [32]. Different instruments were also used to assess maternal knowledge and educational outcomes, which limits direct comparison between studies [13]. The review used narrative and thematic synthesis rather than meta-analysis. Consequently, pooled effect estimates could not be calculated and the magnitude of intervention effectiveness could not be statistically summarized [15]. Only a limited number of included studies specifically investigated neonatal asphyxia. Consequently, some of the conclusions related to neonatal asphyxia prevention were informed by evidence derived from broader studies of maternal and newborn health education [9]. Another limitation was the restriction to English-language publications retrieved from selected electronic databases, which may have introduced language, publication, and database selection bias [14].

Future investigations should place greater emphasis on rigorously designed randomized controlled trials using standardized intervention protocols and validated outcome measures to strengthen the evidence supporting video-based maternal health education [19]. Research should also directly compare variations in video format, intervention duration, delivery platform, and the use of video-based education alongside face-to-face counselling to determine which intervention characteristics are associated with greater educational benefits [7]. Further investigation should determine whether gains in maternal knowledge are

sustained over time and accompanied by changes in health-seeking behaviour. In particular, studies should assess whether better recognition of neonatal asphyxia risk factors is associated with earlier healthcare-seeking and more timely referral [3]. Longitudinal studies are additionally warranted to explore whether improvements in maternal educational outcomes may ultimately be associated with measurable changes in neonatal outcomes.

Taken as a whole, the findings of this review suggest that video-based health education may serve as a useful complementary approach to supporting maternal knowledge, awareness, preparedness, and engagement during pregnancy [5]. This interpretation is generally in line with previous research reporting favorable educational outcomes associated with video-based maternal health interventions [12]. Nevertheless, the available evidence more clearly supports improvements in maternal educational outcomes than any direct effect on the reduction of neonatal asphyxia. Accordingly, the potential preventive contribution of video-based education is better viewed within a broader pathway that encompasses maternal knowledge, recognition of risk, health-seeking behaviour, antenatal assessment, and appropriate clinical management.

Drawing on the evidence from the included studies, a conceptual framework was developed to illustrate how video-based education may relate to improvements in maternal knowledge and behavioral preparedness, and how these intermediate outcomes may contribute to neonatal asphyxia risk prevention.

Figure 2. Conceptual Framework of the Role of Video-Based Health Education in Enhancing Pregnant Women's Knowledge of Neonatal Asphyxia Risk Factors Based on the Health Belief Model (HBM).

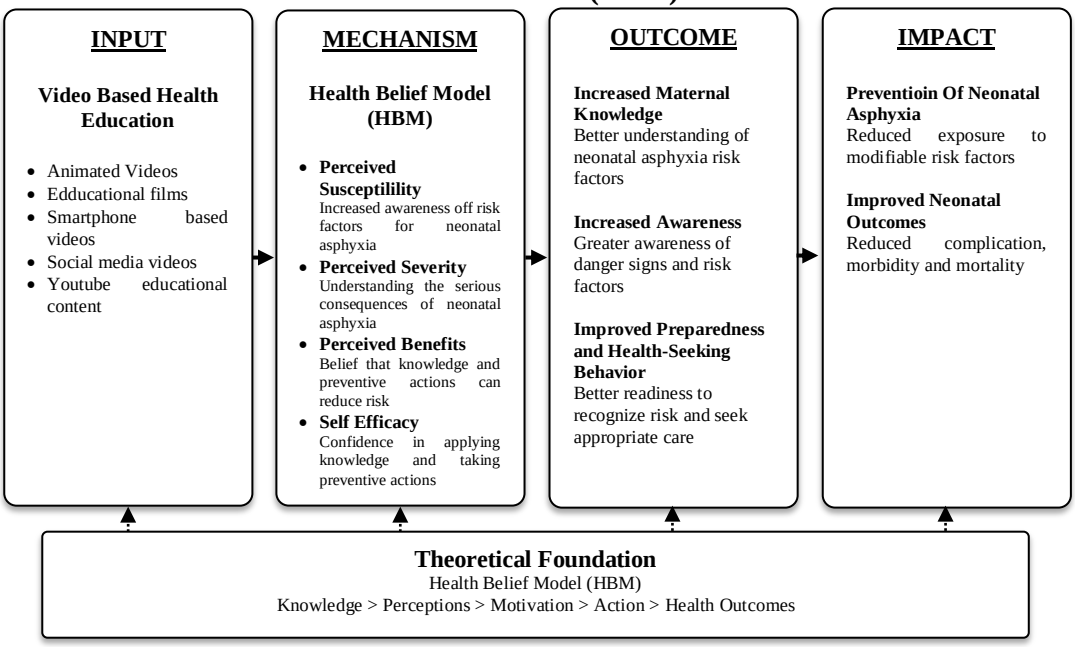


Figure 2 presents a conceptual pathway in which video-based educational interventions may enhance maternal knowledge and risk perception, potentially supporting the adoption of preventive health behaviors and contributing to neonatal asphyxia risk prevention. Within this framework, video-based health education may function as a complementary strategy for strengthening maternal awareness and supporting timely preventive actions during pregnancy.

CONCLUSIONS

Overall, the evidence synthesized in this literature review suggests that video-based health education may provide a useful means of strengthening pregnant women's knowledge, awareness, and preparedness regarding factors associated with neonatal asphyxia. Across the included studies, audiovisual educational interventions were generally linked to better maternal understanding of pregnancy-related complications, neonatal danger signs, and appropriate preventive health practices across diverse healthcare settings. These findings support the potential use of video-based education as a complementary component of antenatal care, particularly for strengthening maternal health education and facilitating access to reliable health information. However, because the majority of the included studies primarily evaluated educational outcomes rather than neonatal asphyxia incidence, the current evidence supports improvements in maternal knowledge and preparedness while evidence regarding direct effects on neonatal outcomes remains limited. Future well-designed studies are needed to evaluate whether these educational improvements translate into measurable benefits for neonatal health outcomes.

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AUTHOR CONTRIBUTIONS

Conceptualization: S.S.N.S., E.F.T.; Methodology: S.S.N.S., E.F.T.; Investigation: S.S.N.S., S.N.S.; Literature Search: S.S.N.S.; Study Selection: S.S.N.S.; Data Extraction: S.S.N.S.; Quality Assessment (JBI): S.S.N.S.; Data Curation: S.S.N.S.; Formal Analysis: S.S.N.S., E.F.T.; Data Interpretation: S.N.S.; Data Synthesis: S.S.N.S.; Writing – Original Draft: S.S.N.S.; Writing – Review & Editing: E.F.T., S.N.S., L.F.L.G., Siskawati; Supervision: E.F.T., S.N.S., L.F.L.G., Siskawati; Validation: E.F.T., S.N.S., L.F.L.G., Siskawati; Project Administration: L.F.L.G.; Resources: L.F.L.G., Siskawati. All authors have read and

approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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