published: 1 Okt 2026
doi: 10.21070/midwiferia.v12i2.1884

Kangaroo Mother Care Beyond Survival: A Systematic Review of Multidimensional Outcomes in Preterm and Low-Birth-Weight Infants

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OPEN ACCESS
ISSN 2548-2246 (online)
ISSN 2442-9139 (print)

Edited by: Salmon Charles P. T. Siahaan
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Received: 6 Sept 2026
Accepted: 29 Sept 2026
Published: 1 Okt 2026

Citation: Kurniati Devi Purnamasari (2026) Kangaroo Mother Care Beyond Survival: A Systematic Review of Multidimensional Outcomes in Preterm and Low-Birth-Weight Infants

Midwiferia Jurnal Kebidanan. 12:2.doi: 10.21070/midwiferia.v12i2.1884

ABSTRACT

Introduction *Preterm and low-birth-weight (LBW) infants face a higher risk of neonatal illness and death. Kangaroo Mother Care (KMC), which utilises skin-to-skin contact and breastfeeding support, is a fundamental care method. This review investigates neonatal outcomes related to KMC and identifies existing gaps in the evidence.* ***Methods*** *A sistematic review was performed using PubMed, ScienceDirect, and Google Scholar. Studies focusing on preterm and/or LBW infants receiving KMC were selected through title, abstract, and full-text screening. A range of study designs and comparison methods were considered. Data concerning study characteristics, interventions, and neonatal outcomes were extracted and synthesised narratively. Ten studies were included in the final review.* ***Results*** *The included studies evaluated physiological stability, milk intake, breastfeeding, growth, mortality, and neurodevelopment, with some also assessing maternal knowledge and satisfaction. Findings differed depending on the intervention, study design, and outcome measures used. Because hospital length of stay was reported inconsistently, it was difficult to draw definitive conclusions regarding its association with KMC.* ***Discussion and Conclusion*** *The reviewed studies suggest that Kangaroo Mother Care (KMC) may be linked to improved neonatal outcomes in preterm and low-birth-weight infants. However, variations in study designs and outcome measures limit the strength and generalisability of these findings*

Keywords *: kangaroo mother care, preterm infants, low birth weight, neonatal outcomes, breastfeeding*

INTRODUCTION

Premature birth and low birth weight are leading causes of illness and death among newborns [1], [2] . According to the World Health Organization (WHO), an estimated 13.4 million babies were born prematurely in 2020; this refers to births that occur before the pregnancy reaches full term before 37 weeks of gestation. Complications related to premature birth have resulted in approximately 900,000 deaths among children under the age of five. Globally, it is estimated that around 2.3 million newborns died within the first month of life in 2022 [3], [4], [5] . Infants born prematurely or with LBW, defined as weighing less than 2,500 grams, are more susceptible to health and developmental issues. KMC is a method for caring for premature and low-birth-weight infants that involves prolonged skin-to-skin contact between the infant and their caregiver, while also supporting breastfeeding [6] .

The availability of appropriate neonatal care resources and trained healthcare professionals varies across healthcare settings, particularly in resource-limited settings. These differences may alter how evidence-based interventions are applied to premature infants and infants with LBW [7] . KMC is a care method that emphasizes skin-to-skin contact between an infant and their caregiver, breastfeeding support, and appropriate follow-up [8] . These core components are intended to support infant physiological stability and feeding, while facilitating caregiver involvement in neonatal care [7]

Evidence from clinical trials and systematic observations has examined the impact of KMC on various neonatal outcomes, such as mortality rates, breastfeeding efforts, and the ability to regulate body temperature [9], [10], [11], [12] . However, the observed effects vary depending on the specific outcomes measured and the study designs employed. The implications of KMC for the duration of hospital stays warrant careful evaluation, as empirical findings on this matter have not been consistently synthesized across scientific literature [12] . While shorter hospital stays may positively influence family well-being and the utilization of healthcare services, the associated economic benefits cannot be assumed automatically without direct supporting evidence [13], [14] . Therefore, addressing the multidimensional neonatal outcomes related to KMC requires careful consideration of the specific outcomes being measured [15] , the characteristics of the studies involved, and the limitations of the available evidence.

KMC can promote physiologic stability of the newborn, facilitate caregiver involvement and transition from hospital to home when clinically appropriate [12], [16], [17] . These aspects are of great relevance in a health care environment that has limitations in the access to resources for special care of the newborn.

KMC can also help caregivers to increase their confidence in caring for their babies; however, its impact on family satisfaction, hospital utilization of resources, nosocomial infections and readmission should be interpreted in the light of specific results evaluated in the available evidence [18], [19] . Claims of reduced length of stay or readmission rates must be directly supported by evidence and should not be implied on the basis of skin-to-skin practice or lactation education only.

METHOD

This Study Design and Search Strategy

This study used a sistematic review design to synthesize evidence on Kangaroo Mother Care (KMC) and neonatal outcomes among preterm and/or low-birth-weight (LBW) infants. The literature search was conducted using PubMed for international journal articles and ScienceDirect for national journal articles. The search strategy in PubMed was: “Kangaroo Mother Care” AND “Preterm Infants” AND “Low Birth Weight” AND “Neonatal Outcomes”. The search terms for ScienceDirect were: “Kangaroo Mother Care” AND “Bayi Prematur” AND “Berat Badan Lahir Rendah” AND “Hasil Neonatal”. The search was restricted to publications from 2015 to 2026.

The selection of studies was done systematically, following the steps presented in the PRISMA flow diagram (Figure 1). Collected records were screened for their relevance to the objectives of the observation based on the titles and abstracts. Records that met the criteria were then reviewed in full. Studies were excluded from the review stage if they did not involve premature infants and/or infants with low birth weight (LBW), did not report relevant birth outcomes, or did not meet the study type and design criteria specified by the researchers. Reports where the full text was not available were also documented. The selection process resulted in 10 studies being included in the final synthesis (see Figure 1).

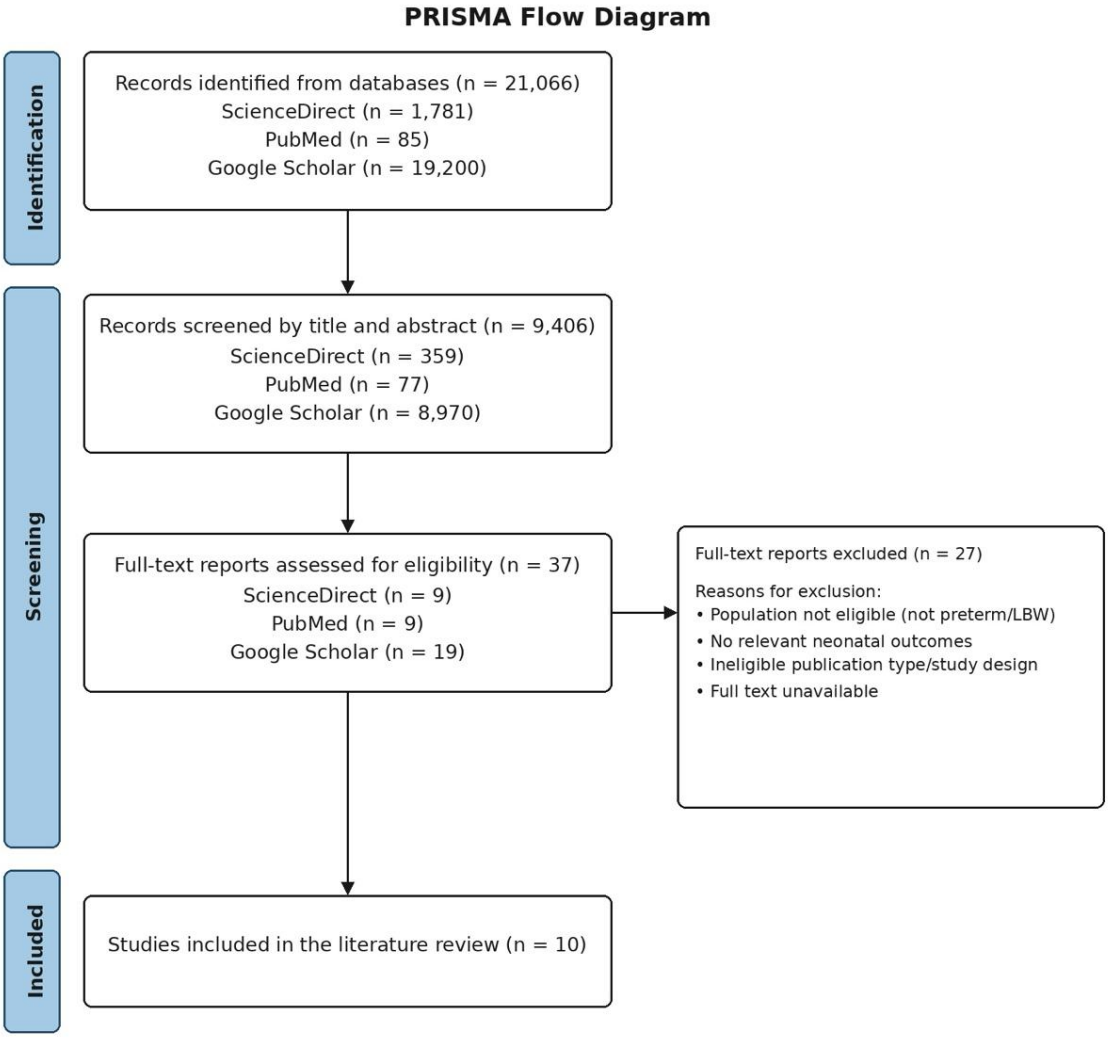


Figure 1. PRISMA flow diagram

Eligibility Criteria

Studies that examined the application or outcomes of KMC in preterm and/or LBW newborns and provided at least one pertinent neonatal outcome were qualified for inclusion. Neonatal survival or death, morbidity, breastfeeding, physiological stability, growth or anthropometric measurements, neurodevelopment, and length of hospital stay when recorded were among the outcomes of interest. Studies that did not assess KMC, did not include preterm or low birth weight babies, or did not provide a pertinent neonatal outcome were eliminated. According to the criteria used during the actual selection process, the review's eligibility criteria should also outline the acceptable study designs, publishing kinds, languages, and healthcare settings.

Study Selection and Data Extraction

The selection of studies involves screening titles and abstracts, followed by a full-text assessment of articles that potentially meet the review's inclusion criteria. The total number of records retrieved from each database, the removal of duplicates, the screening process, the full-text articles assessed, the justifications provided, and the final number of included studies must be reported in full. Data extraction should capture study characteristics, population, KMC intervention and comparator where applicable, study design, setting, neonatal outcomes assessed, and principal findings.

RESULTS

A total of 10 studies were included in the literature extraction presented in Table 1. The included studies varied in their research designs, sample sizes, study settings, and outcome measures. The reported outcomes covered neonatal physiological parameters, breastfeeding and human milk intake, growth and anthropometric measures, survival and mortality, morbidity, neurodevelopment, and maternal knowledge and satisfaction. Because the included studies assessed different outcomes, their findings are presented according to the specific outcome domains reported in each study rather than assuming a uniform effect of KMC across all neonatal outcomes.

Table 1. Summary of Articles Included in the Review

No.	Title of Article	Year	Study design	Research Objective	Sample	Main findings
1	Kangaroo Mother Care in Preterm and Low-Birth-Weight Infants: Physiological Responses and Maternal Knowledge and Satisfaction in Neonatal Intensive Care Units in the West Bank, Palestine	2026	Single-group quasi-experimental study with a cross-sectional descriptive component	To evaluate neonatal physiological responses and maternal knowledge and satisfaction following KMC.	52 mothers and preterm/LBW infants with gestational ages of 26–36 weeks.	Following a 30-minute KMC session, significant changes were reported in oxygen saturation, respiratory rate, heart rate, and body temperature (\(p<0.001\)). Mothers generally demonstrated

No.	Title of Article	Year	Study design	Research Objective	Sample	Main findings
						moderate knowledge and high satisfaction. The absence of a control group limits conclusions about the causal effects of KMC.
2	Effect of Kangaroo Mother Care Initiated Within the First 24 h in Preterm or Low Birth Weight Infants: A Systematic Review and Meta-analysis	2026	Systematic review and meta-analysis of randomized controlled trials	To evaluate the effects of KMC initiated within the first 24 hours of life compared with standard care.	13 RCTs involving 4,162 preterm and/or LBW infants.	The review reported improved cardiorespiratory stability, lower neonatal mortality, and higher breastfeeding rates at discharge. No significant differences were reported for blood glucose levels, NICU transfer, or surfactant use. The underlying effect estimates and confidence intervals should be added where available.
3	Effect of Kangaroo Mother Care in Low Birth Weight Infants on Human Milk Intake: A Randomized Controlled Trial	2025	Randomized controlled trial	To evaluate the effects of KMC-related education and care on human milk intake and milk components among LBW infants during the neonatal period.	550 LBW infants.	KMC was reported to be associated with increased human milk intake. The magnitude of the effect and its statistical significance should be reported from the original article if available.

No.	Title of Article	Year	Study design	Research Objective	Sample	Main findings
4	A Comparative Study of the Effects of Kangaroo Care by Mothers and Maternal Grandmothers on the Vital Signs of Hospitalized Preterm Newborns: A Randomized Controlled Clinical Trial Study	2023	Randomized controlled clinical trial	To compare the effects of KMC provided by mothers and maternal grandmothers on neonatal vital signs.	90 preterm neonates.	Significant pre–post changes in vital signs were reported within the study groups (\(p<0.05\)). However, no statistically significant differences were observed between the maternal KMC and maternal-grandmother KMC groups (\(p>0.05\)). These findings do not establish that the two approaches are equivalent.
5	The Effect of Post-discharge Kangaroo Mother Care With and Without Telephone Advice on Anthropometric Indexes of Preterm Newborns: A Randomized Clinical Trial	2025	Randomized clinical trial	To compare anthropometric outcomes among preterm infants receiving post-discharge KMC with or without telephone advice and the relevant comparison group(s).	105 discharged preterm infants.	The reported mean weight was significantly higher in an intervention group than in the conventional-care (CC) group (\(p=0.006\)). No statistically significant differences were reported for other anthropometric indices. The exact group comparisons and follow-up time points require verification.
6	Kangaroo Mother Care for Low Birth Weight Babies: A Randomized	2017	Randomized controlled trial	To evaluate KMC compared with standard care	80 participants.	The study reported benefits related to weight gain and

No.	Title of Article	Year	Study design	Research Objective	Sample	Main findings
	Controlled Trial in a Tertiary Care Hospital of Bangladesh			among LBW infants.		exclusive breastfeeding. Numerical results and statistical estimates should be added from the original publication to establish the magnitude and precision of these findings.
7	Kangaroo Mother Care (KMC): An Alternative to Conventional Method of Care for Low Birth Weight Babies	2016	Randomized controlled trial	To compare KMC with conventional care in terms of anthropometric outcomes among LBW infants.	120 neonates.	The study reported improvements in growth, reduced morbidity, and shorter duration of care among infants receiving KMC. The specific measures, effect estimates, and definition of "duration of care" should be verified in the original article before interpreting this outcome as hospital length of stay.
8	Effect of Community-initiated Kangaroo Mother Care on Survival of Infants With Low Birthweight: A Randomized Controlled Trial	2019	Randomized controlled trial	To assess the effects of community-initiated KMC on outcomes among infants weighing 1,500–2,250 g.	8,402 infants.	The study investigated infant survival following community-initiated KMC and reported a survival benefit. The specific mortality outcomes, effect estimates, and

No.	Title of Article	Year	Study design	Research Objective	Sample	Main findings
						follow-up period should be extracted from the original article. Findings from community-based care should be distinguished from evidence on hospital length of stay.
9	Effect of Kangaroo Mother Care on Physiological Parameters in Low Birth Weight Neonates	2019	Quasi-experimental study	To evaluate changes in physiological parameters among LBW infants receiving KMC in a tertiary healthcare setting.	70 infants.	Improvements in oxygen saturation, respiratory rate, blood pressure, and heart rate were reported following KMC. The direction and magnitude of change, statistical significance, and timing of measurement require verification from the original article.
10	Effect of Kangaroo Mother Care on Neurodevelopmental Outcome of Low Birth Weight Babies: A One-year Randomized Control Trial	2018	Randomized controlled trial	To assess neurodevelopmental outcomes among LBW infants receiving KMC.	80 participants.	The study evaluated neurodevelopment using the BSID-II and Amiel-Tison assessment methods. The original article should be checked to establish the reported neurodevelopmental findings and

No.	Title of Article	Year	Study design	Research Objective	Sample	Main findings
						the basis for any comparison between the two assessment tools.

Abbreviations: KMC, Kangaroo Mother Care; LBW, low birth weight; RCT, randomized controlled trial; NICU, neonatal intensive care unit; BSID-II, Bayley Scales of Infant Development, Second Edition.

DISCUSSION

Ten studies were listed in the literature extraction table 1. The included records covered a range of study designs, including randomized controlled trials, quasi-experimental studies, and one systematic review and meta-analysis. The reported sample sizes of the primary studies ranged from 52 mother–infant pairs to 8,402 infants, whereas the systematic review synthesized 13 randomized controlled trials involving 4,162 infants. These sample sizes represent different units of analysis and should not be directly compared. The studies examined several outcome domains, including neonatal physiological stability, human milk intake, breastfeeding, growth, survival, maternal knowledge and satisfaction, and neurodevelopment.

The 2025 randomized controlled experiment with 550 low birth weight infants investigated the consumption of human milk after education and care connected to Kangaroo Mother Care. Based on the study, infants who received the intervention consumed more human milk. To facilitate a more accurate interpretation, the effect's magnitude and statistical estimates should be supplied from the original article [20] .

Research from Bangladesh in 2017 and India in 2016 also showed that newborns getting KMC had better results than those receiving traditional care in terms of growth, weight gain, breastfeeding, or morbidity [21], [22] . Nevertheless, the available extraction does not provide sufficient numerical results to determine the magnitude of these effects or establish whether the findings were consistent across the studies. Accordingly, the results suggest potential benefits of KMC for feeding and growth, but the strength of this evidence cannot be determined from the extracted summaries alone.

A randomized clinical trial published in 2025 evaluated post-discharge KMC with and without telephone advice among 105 preterm infants. The study results show that the mean body weight in the intervention group was significantly greater than that in the standard care group (p=0.006), while there were no statistically significant differences in

other anthropometric measures. The original article should be consulted to confirm the group comparisons, intervention components, follow-up period, and specific anthropometric outcomes [23] . These findings concern post-discharge growth and should not be interpreted as evidence of reduced hospital length of stay.

Two studies in the extraction table specifically examined physiological parameters following KMC. A quasi-experimental study conducted in 2019 reported improvements in oxygen saturation, respiratory rate, blood pressure, and heart rate among LBW infants receiving KMC [24] . Another study, published in 2026, evaluated a 30-minute KMC session among 52 mothers and preterm/LBW infants and reported statistically significant changes in oxygen saturation, respiratory rate, heart rate, and body temperature ((p<0.001)).

A randomized controlled trial published in 2023 compared KMC provided by mothers with KMC provided by maternal grandmothers. The extracted results indicated significant pre–post changes in vital signs within the study groups ((p<0.05)), but no statistically significant differences between the two caregiver groups ((p>0.05)) [25] . These findings suggest that physiological parameters may change following KMC and that different caregivers may be able to provide skin-to-skin care. However, the absence of statistically significant differences between caregiver groups does not, by itself, establish equivalence. Furthermore, without detailed effect estimates and information about study limitations, the magnitude and clinical significance of the reported changes remain uncertain.

A community-initiated randomized controlled trial published in 2019 involving 8,402 infants weighing 1,500–2,250 g investigated the effects of KMC on infant survival. The study was reported to show improved survival following community-initiated KMC. The exact survival and mortality outcomes, effect estimates, confidence intervals, and follow-up period should be extracted from the original publication before the magnitude of benefit is described.

A separate systematic review and meta-analysis of 13 randomized controlled trials involving 4,162 preterm and/or LBW infants reported that KMC initiated within the first 24 hours was associated with improved cardiorespiratory stability, lower neonatal mortality, and higher breastfeeding rates at discharge. It reported no significant differences in blood glucose levels, NICU transfer, or surfactant use. The pooled

estimates and certainty of evidence should be examined to establish the precision and reliability of these findings.

Taken together, these records indicate that survival and mortality are important outcomes in the KMC literature. However, the community-based trial and the systematic review represent different levels and contexts of evidence. In addition, the systematic review may include primary studies that overlap with other records in this literature review. Their findings should therefore not be counted as independent evidence without checking the included studies and their potential overlap.

One randomized controlled trial published in 2018 examined neurodevelopmental outcomes among LBW infants over a one-year period [26] . The Amiel-Tison assessment method and the Bayley Scales of Infant Development, Second Edition (BSID-II) are mentioned in the extracted summary. However, the existing evidence does not give adequate detail about between-group differences, effect estimates, or the specific developmental outcomes investigated. To determine whether infants receiving KMC had better neurodevelopmental outcomes than those receiving standard care and to elucidate the function of each evaluation tool, the original publication should be studied.

The efficacy of KMC itself should be discussed independently from the relative performance of the BSID-II and Amiel-Tison approaches. The results should not be extrapolated to all preterm or LBW newborns or taken as conclusive proof of long-term benefit because the current extraction only finds one study with a one-year neurodevelopmental follow-up.

The studies presented in Table 1 did not consistently provide hospital length of stay. Even though the 2016 study found that infants receiving KMC had shorter hospital stays, the original publication has to be examined to see if this result accurately reflected hospital length of stay and how it was calculated [22] . Physiological factors, eating, growth, survival, maternal outcomes, or neurodevelopment were the main topics of the other selected research. Therefore, the current evidence summary does not establish a consistent effect of KMC on hospital length of stay.

Similarly, the available extraction does not show that safety outcomes or adverse events were systematically assessed across all included studies. Therefore, it is impossible to draw the conclusion that KMC was consistently safe in all contexts and demographics based just on this chart. Only results directly reported in the original research should be considered when discussing safety.

Midwifery practice may be affected by potential obstacles to KMC implementation, including staff training, infrastructure, cultural acceptability, and continuity of support following discharge. Nevertheless, these obstacles were not methodically retrieved as results in the current table. Unless supported by a separate, documented evidence search, they should be presented as contextual considerations rather than findings of this literature review.

Numerous neonatal outcome domains, such as physiological parameters, human milk intake, growth, survival, and neurodevelopment, are covered by the papers included in this review.

Some studies indicated beneficial outcomes connected with KMC, whereas others found no statistically significant differences in particular outcomes or comparisons. The variability of study designs, populations, intervention protocols, and outcome measures hinders direct comparisons and precludes a single conclusion from being applied to all outcome domains.

KMC may be considered a significant approach to the care of preterm and LBW newborns, however the findings of this review should be taken in light of the methodological quality of the included studies and the constraints of the extraction procedure. Future studies should utilize clearly specified outcome measures, give effect estimates and confidence intervals, and analyze outcomes such as hospital length of stay and adverse events directly. For midwifery practice, the data should be assessed alongside appropriate clinical guidelines and the particular needs and clinical condition of each newborn.

CONCLUSION

Physiological stability, human milk intake, breastfeeding, growth, survival, and neurodevelopment are just a few of the newborn outcome categories in which KMC has been shown to be beneficial for preterm and low birth weight infants. However, the results should be interpreted cautiously because the outcomes evaluated and the study designs varied among the available literature. Despite the fact that KMC has been linked to positive outcomes in a number of studies, the evidence that is currently available does not demonstrate a consistent effect across all outcome domains or provide a consistent determination of the benefit's magnitude.

KMC may play a significant role in the newborn treatment of LBW and preterm infants. The infant's clinical status, relevant clinical advice, and the availability of suitable caregiver and medical support should all serve as guidelines for its execution. To understand the impact of KMC on certain outcomes, such as hospital length of stay and long-term neurodevelopment, more research utilizing rigorous study designs, standardized end measurements, and open reporting is required. To determine context-specific obstacles and tactics for maintaining KMC in hospital and community settings, especially those with low resources, more implementation study is also required.

LIMITATION

This review has significant limitations. Direct comparisons amongst the included studies were limited because to differences in design, sample size, population characteristics, KMC implementation, follow-up periods, and outcome measures. Overlap in the underlying evidence may also occur when primary investigations are combined with a systematic review and meta-analysis. Additionally, not all outcomes were consistently provided with effect estimates, confidence ranges, or comprehensive statistical data by the available extraction. The dependability of the results cannot be fully assessed in the absence of a thorough methodological quality or risk-of-bias evaluation. These restrictions make it more difficult to measure KMC's overall effects and emphasize the necessity for careful interpretation of the published results.

ACKNOWLEDGMENT

The author acknowledges the efforts of the researchers whose work informed this sistematic study. The author additionally appreciates the constructive criticism received during article preparation.

AUTHOR CONTRIBUTIONS

Author 1: Kurniati Devi Purnamasari: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing – Original Draft, and Writing – Review & Editing.

Author 2: Widya Maya Ningrum: Methodology, Investigation, Data Collection, Critical Review, and Writing – Review & Editing.

Author 3: Siti Fatimah: Validation, Data Analysis, Interpretation of Findings, Manuscript Editing, and Writing – Review & Editing.

Author 4: Sri Heryani: Supervision, Validation, Conceptualization, and Writing – Review & Editing.

Author 5: Kartikasari: Investigation, Data Collection Assistance, Data Organization, and Manuscript Preparation Support.

All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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