

COMPLIANCE WITH ESSENTIAL NEWBORN CARE PRACTICES: FINDINGS FROM A MULTIREGIONAL PILOT SURVEY

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ABSTRACT

Essential newborn care supports physiological adaptation and neonatal safety, but consistency of implementation may vary across service settings. Objective: To describe compliance with essential newborn care, identify components requiring improvement, and analyze score differences according to provider characteristics. This cross-sectional pilot analysis included 32 responses from health workers across several Indonesian regions. Twenty-eight items were scored 2 when performed according to standard, 1 when partially or incompletely performed, and 0 when not performed; non-applicable or unassessable responses were excluded from denominators. Composite and domain scores were summarized descriptively, while group differences were examined using Kruskal-Wallis tests. The mean composite score was 97.50% with a standard deviation of 6.17, the median was 100.00%, and 30 respondents, or 93.8%, were categorized as having very good compliance. The lowest domain was skin-to-skin contact and early breastfeeding initiation at 94.53%. Full compliance was lowest for documenting breastfeeding initiation with its time or outcome at 84.4%, checking resuscitation equipment readiness at 87.1%, and helping mothers recognize feeding readiness cues at 87.5%. No significant score differences were found by facility type, training history, or age group. Reported compliance was high, but breastfeeding initiation documentation, resuscitation readiness, and breastfeeding support remain improvement priorities requiring confirmation through episode-based clinical audit in diverse service settings.

Keywords : Early Breastfeeding Initiation; Essential Newborn Care; Midwifery Services; Newborn Safety; Quality Audit

1. INTRODUCTION

The transition from intrauterine to extrauterine life requires rapid respiratory, cardiovascular, thermal, metabolic, and behavioral adaptation. During this period, a newborn may deteriorate quickly when breathing is not established, heat is lost, infection prevention is inconsistent, or feeding support is delayed. Essential newborn care therefore combines a series of low-cost, time-sensitive practices that protect physiological stability while allowing prompt recognition and management of complications. The World Health Organization (WHO, 2022a) emphasizes immediate assessment, thorough drying, thermal protection, skin-to-skin contact, early initiation of breastfeeding, resuscitation when required, infection prevention, danger-sign recognition, and appropriate referral as interconnected components rather than isolated clinical tasks.

Quality in newborn care cannot be inferred solely from the availability of skilled birth attendance or written clinical standards. What matters is whether every eligible newborn actually receives each recommended component at the appropriate time and whether the action is documented sufficiently to support continuity of care. The WHO standards for maternal and newborn care describe process indicators as an essential bridge between facility inputs and clinical outcomes (WHO, 2016). In the Indonesian context, national guidance similarly positions immediate care, prophylaxis, examination, monitoring, counseling, and documentation as standard components of newborn services (Ministry of Health of the Republic of Indonesia, 2020a). These expectations are also embedded in professional midwifery competencies (Ministry of Health of the Republic of Indonesia, 2020b).

Despite clear recommendations, implementation may remain uneven. Observational evidence from a district hospital in Rwanda showed that several routine practices for healthy newborns were not consistently completed, particularly uninterrupted skin-to-skin care and breastfeeding-related actions (Stensgaard et al., 2022). A systematic review of implementation strategies in low- and lower-middle-income countries likewise found variable coverage and incomplete reporting of essential newborn care interventions (Peven et al., 2020). Such variation is important because a package can appear satisfactory at the aggregate level while a few repeatedly missed elements continue to expose newborns to avoidable risks.

Skin-to-skin contact and early breastfeeding are particularly sensitive to clinical workflow. Both practices require coordination between birth attendants, protection from unnecessary mother-newborn separation, and active support rather than a simple instruction to the mother. Implementation work has shown that improvement is possible when facilities combine clear protocols, staff engagement, workflow redesign, and regular feedback (Bhardwaj et al., 2024). Documentation is equally important: recording the start, duration, outcome, or reason for non-performance distinguishes a clinically justified exception from an implementation or recording failure.

The original research protocol was designed as a multisite clinical audit in health facilities in the Kediri area, with a target of at least 107 newborn care episodes and a sequential explanatory mixed-method component. The dataset available at this reporting stage differed from that protocol. It contained questionnaire responses from health workers located in several districts and provinces, and it did not include direct

observation records, medical-record abstraction fields, or qualitative interview transcripts. A transparent pilot analysis was therefore needed to determine what the existing data could validly show, to assess the scoring system, and to identify items requiring closer observation in the planned main audit.

This study aimed to describe overall and domain-specific compliance with essential newborn care in the available pilot dataset, identify practices most frequently reported as partial or not performed, and explore whether composite scores differed according to facility type, previous newborn-care training, and age group. The study was not intended to estimate the prevalence of compliance in Kediri or establish causal relationships. Instead, it provides preliminary evidence for instrument refinement, audit prioritization, and the design of a more rigorous episode-based evaluation.

2. METHODS

Study design and data source. This was a cross-sectional secondary analysis of responses recorded in the spreadsheet entitled ASUHAN ESENSIAL BBL (Jawaban). The file represented an early data-collection stage of the broader essential newborn care evaluation. The unit of analysis in this article was one health worker or care provider who completed the survey. The analysis used all valid response rows after removing the first worksheet row, which contained repeated question labels rather than respondent data.

Study context and participants. Thirty-two respondents from several Indonesian districts and provinces were included. They reported working in community health centers, hospitals, independent midwifery practices, a clinic, or other service settings. Eligibility could not be reconstructed beyond the completed survey because the

spreadsheet did not include screening logs. Consequently, the sample was treated as an available pilot sample rather than a probability or consecutive sample. The geographical distribution also meant that the data could not be considered representative of the Kediri facilities specified in the original protocol.

Instrument and domains. The survey included five general characteristics and 28 essential newborn care items derived from the audit checklist in the protocol. The items covered seven domains: preparation and infection prevention; immediate assessment and care; skin-to-skin contact and early breastfeeding; thermoregulation and rooming-in; prophylaxis and immunization; examination and monitoring; and education and documentation. Examples included identification of maternal-neonatal risk before birth, readiness of resuscitation equipment, immediate assessment of breathing and tone, thorough drying, replacement of wet cloths, delayed cord clamping as clinically appropriate, temperature measurement, vitamin K administration, newborn identification, danger-sign assessment, family education, and documentation in medical records or the maternal and child health book.

Scoring. Responses were scored as 2 for performed according to standard, 1 for partially performed or incomplete, and 0 for not performed. Responses indicating that an item was not applicable because of clinical condition or indication, or that it could not be assessed, were excluded from that respondent's denominator. The composite score was calculated as the sum of obtained scores divided by twice the number of eligible items and multiplied by 100. Domain scores were calculated in the same way. Based on the protocol, composite scores were classified as very good (90% or higher), good (80% to below 90%), sufficient

(60% to below 80%), or low (below 60%). A separate full-compliance proportion for each item was calculated as the number of responses marked performed according to standard divided by all eligible responses.

Data cleaning and quality control. Facility labels and age-category capitalization were standardized without altering substantive responses. Non-applicable and unassessable responses were retained as exclusions rather than recoded as non-compliance. Frequencies were reconciled against 32 respondents and 28 items. The scoring rules were applied programmatically to minimize manual calculation error. Item-level 95% confidence intervals for full compliance were calculated using the Wilson method, which is more appropriate than a normal approximation for small samples and proportions close to 100%.

Statistical analysis. Categorical characteristics were summarized with frequencies and percentages. Composite and domain scores were described using the mean, standard deviation, median, interquartile range, and minimum-maximum values. The score distribution showed a strong ceiling effect, and several comparison groups were small. Therefore, exploratory comparisons by facility type, training history, and age group used Kruskal-Wallis tests. A two-sided p-value below 0.05 was considered statistically significant. Multivariable regression planned in the main protocol was not performed because the sample size and available covariates were inadequate for stable adjusted estimates.

Interpretive framework. Results were interpreted through a structure-process-outcome quality lens. Facility type and previous training were treated as contextual characteristics, whereas the 28 checklist items represented care processes. The

composite score was used as a summary measure, but item- and domain-level findings were prioritized because a high total can conceal a clinically important omission. No neonatal outcome was attributed to provider compliance because the spreadsheet contained neither clinical outcome measures nor temporal linkage between a provider response and a specific newborn. This distinction was maintained throughout the analysis to prevent causal claims unsupported by the available design.

3. RESULTS

Respondent characteristics. Of the 32 respondents, 19 (59.4%) worked in community health centers, five (15.6%) in hospitals, five (15.6%) in independent midwifery practices, one (3.1%) in a clinic, and two (6.3%) in other settings. Fourteen respondents (43.8%) were aged 36-45 years, nine (28.1%) were aged 31-35 years, five (15.6%) were aged 20-30 years, and four (12.5%) were older than 45 years. Twenty-six respondents (81.3%) reported previous participation in newborn-care, normal birth care, or neonatal resuscitation training.

Table 1. Characteristics of research respondents (n=32)

Characteristic	Category	Frequency (n)	Percent age (%)
Facility	Community health center	19	59.4
	Hospital	5	15.6
	Independent midwifery practice	5	15.6
	Clinic	1	3.1
	Other	2	6.2
Age group	20-30 years	5	15.6
	31-35 years	9	28.1
	36-45 years	14	43.8

Characteristic	Category	Frequency (n)	Percentage (%)
	>45 years	4	12.5
Previous newborn-care training	Yes	26	81.2
	No	6	18.8

Overall compliance. The mean composite achievement score was 97.50% (SD 6.17), with a median of 100.00% (IQR 97.77-100.00) and a range of 67.86-100.00%. Thirty respondents (93.8%) were classified as having very good compliance, one (3.1%) as good, and one (3.1%) as sufficient; no respondent was classified as low. The mean respondent-level proportion of items reported as fully compliant was 95.38%. Twenty-three respondents obtained the maximum composite score, demonstrating substantial concentration at the upper boundary.

Domain performance. Prophylaxis and immunization achieved the highest mean domain score (100.00%), followed by examination and monitoring (98.83%), immediate assessment and care (97.81%), preparation and infection prevention (97.53%), education and documentation (97.50%), and thermoregulation and rooming-in (96.88%). Skin-to-skin contact and early breastfeeding had the lowest mean score (94.53%) and the greatest practical priority because several related actions were reported as incomplete.

Table 2. Composite and domain-specific compliance scores

Measure	Mean (%)	SD	Median (%)
Overall composite	97.50	6.17	100.00
Preparation and infection prevention	97.53	6.16	100.00

Measure	Mean (%)	SD	Median (%)
Immediate assessment and care	97.81	5.53	100.00
Skin-to-skin contact and early breastfeeding	94.53	10.97	100.00
Thermoregulation and rooming-in	96.88	12.30	100.00
Prophylaxis and immunization	100.00	0.00	100.00
Examination and monitoring	98.83	6.63	100.00
Education and documentation	97.50	8.03	100.00

Item-level gaps. Documentation of early breastfeeding initiation with its time or outcome had the lowest full-compliance proportion: 27 of 32 respondents (84.4%) reported full performance and five (15.6%) reported partial performance. Resuscitation-equipment readiness was fully performed by 27 of 31 eligible respondents (87.1%), while four (12.9%) reported partial completion. Helping mothers recognize feeding readiness cues was fully performed by 28 respondents (87.5%), partially performed by three (9.4%), and not performed by one (3.1%). Placement of a stable newborn in skin-to-skin contact and education regarding breastfeeding and warmth were each fully performed by 29 respondents (90.6%). Single non-performance responses were also observed for delaying the newborn's bath and providing umbilical-cord-care education.

Table 3. Essential newborn care items with the lowest full-compliance proportions

Item	Standard	Partial	Not done	Full compliance (%)
IMD dicatat beserta waktu atau hasilnya.	27	5	0	84.4
Alat resusitasi diperiksa dan siap digunakan.	27	4	0	87.1
Ibu dibantu mengenali tanda kesiapan menyusui.	28	3	1	87.5
Bayi stabil ditempatkan kontak kulit ke kulit.	29	3	0	90.6
Ibu/keluarga menerima edukasi ASI dan kehangatan.	29	3	0	90.6
Kontak kulit ke kulit dipertahankan tanpa pemisahan yang tidak perlu.	29	2	0	93.5
Mandi ditunda sesuai standar.	29	1	1	93.5
Pelekatan dan posisi menyusui dinilai/ dibantu.	30	2	0	93.8

Exploratory comparisons. Mean scores were 96.36% in community health centers, 100.00% in hospitals, 97.86% in independent midwifery practices, and 100.00% in the clinic and other category. Differences by facility type were not statistically significant

(Kruskal-Wallis $H=4.456$; $p=0.348$). Respondents with previous training had a mean score of 98.31%, compared with 94.03% among those without training; this difference was also not significant ($H=0.182$; $p=0.670$). Scores did not differ significantly across age groups ($H=3.828$; $p=0.281$). These tests were exploratory because of small, unequal groups and the ceiling effect.

Table 4. Exploratory comparison of composite scores

Variable	Group	n	Mean (%)	Median (%)
Facility	Community health center	19	96.36	100.00
	Hospital	5	100.00	100.00
	Independent midwifery practice	5	97.86	100.00
	Clinic	1	100.00	100.00
	Other	2	100.00	100.00
	Kruskal-Wallis		$H=4.456$; $p=0.348$	
Training	Yes	26	98.31	100.00
	No	6	94.03	100.00

Variable	Group	n	Mean (%)	Median (%)
	Kruskal-Wallis H=0.182; p=0.670			
Age	36-45 years	14	99.36	100.00
	>45 years	4	95.98	97.32
	31-35 years	9	94.83	100.00
	20-30 years	5	98.33	100.00
	Kruskal-Wallis H=3.828; p=0.281			

4. DISCUSSION

This pilot survey produced three principal findings. First, self-reported composite compliance with essential newborn care was very high. Second, the remaining gaps clustered around early breastfeeding and skin-to-skin care, resuscitation readiness, selected thermal-care actions, and documentation. Third, no statistically significant score differences were detected by facility type, training history, or age. The findings provide a useful map for the main audit, but they should not be interpreted as evidence that clinical

performance is uniformly optimal across the participating settings.

The high score must be interpreted in light of measurement context. Twenty-three of 32 respondents reached the maximum composite score, creating a strong ceiling effect. Self-report instruments are useful for rapid screening and for identifying practices that providers themselves recognize as difficult, but they are vulnerable to social desirability and recall bias. When questions describe professionally expected behavior, respondents may select the standard answer even when implementation varies by workload, shift, availability of supplies, clinical urgency, or documentation practices. Direct observation and medical-record review remain necessary to distinguish knowledge of standards from actual delivery of care.

The concentration of gaps in skin-to-skin contact and early breastfeeding is clinically and operationally meaningful. These practices require more than placing a newborn briefly on the mother's chest. Effective implementation includes maintaining uninterrupted contact when the mother and newborn are stable, observing feeding readiness cues, assisting positioning and attachment, and documenting timing and outcomes. Evidence from facility-based implementation work indicates that skin-to-skin care improves when staff share a clear protocol, workflow barriers are addressed, and feedback is embedded into routine quality improvement (Bhardwaj et al., 2024). The present results suggest that documentation should be treated as part of the intervention rather than as an administrative activity added after care.

Documentation of early breastfeeding initiation was the single lowest item. Incomplete records can obscure whether care was omitted, partly completed, interrupted for a clinical reason, or simply

not recorded. This ambiguity affects continuity of care and weakens audit validity. A structured field should capture the start time, duration or feeding outcome, support provided, and the reason when initiation is delayed or contraindicated. Such a field would allow facilities to separate justified clinical exceptions from workflow failures and could improve the reliability of subsequent audit cycles.

Resuscitation-equipment readiness was another priority. Most respondents reported full compliance, yet four indicated only partial performance. Readiness must be confirmed before every birth because the need for ventilation cannot always be predicted. A short pre-birth checklist can assign responsibility for checking the bag and mask, suction device where indicated, heat source, towels, timing device, and escalation pathway. This process links the structure and process dimensions of quality: equipment may be present in the room but still fail to protect the newborn if it has not been checked, assembled, or positioned for immediate use.

Thermal-care gaps were smaller but should not be dismissed. Delaying bathing, measuring temperature, replacing wet cloths, covering the head, maintaining skin-to-skin contact, and avoiding unnecessary separation operate as a coordinated thermal-protection package. A single omitted element may be compensated for in a stable environment, but repeated inconsistency can increase risk, particularly among preterm or low-birth-weight newborns. WHO guidance places thermal protection alongside breathing assessment and feeding support as an immediate-care priority (WHO, 2022a). Future observation should record the timing of drying, temperature measurement, and bathing rather than only yes-or-no completion.

The absence of statistically significant differences among facility categories should not be read as equivalence. Hospitals and the single clinic had mean scores of 100%, but these groups contained only five and one respondent, respectively. Community health centers contained most respondents and included the lowest individual score, producing greater variability. Small groups, unequal allocation, and a maximum-score cluster markedly reduced statistical power. A multisite episode-based study should use proportional recruitment by delivery volume and consider clustering within facilities, as planned in the original protocol.

Training history showed a directionally higher mean among previously trained respondents, but the association was not significant. The survey recorded only whether training had ever occurred. It did not capture training type, date, duration, simulation exposure, assessment results, or opportunities to apply skills. A provider trained many years earlier and a provider who completed recent competency-based simulation were therefore classified identically. The main audit should measure recency and content of training and examine whether routine drills, supervision, and access to standard operating procedures are associated with observed performance.

The study also demonstrates the importance of aligning the analytical unit with the research question. The protocol defined one newborn-care episode as the quantitative unit, whereas the available dataset captured one provider's reported practice. Provider-level data describe perceptions and stated routines; episode-level data describe what a particular newborn received. Both can contribute to quality improvement, but they answer different questions. Combining them without distinction would exaggerate certainty. The main study should preserve

separate identifiers for facility, provider, mother, and newborn episode while maintaining confidentiality, allowing analysis of provider and facility clustering.

Comparison with earlier research should therefore focus on the pattern rather than the absolute percentage. Stensgaard et al. (2022) identified variation in essential care for healthy newborns, including practices that depend on uninterrupted mother-newborn contact. Peven et al. (2020) found that implementation strategies and reporting varied widely across settings, reinforcing the need to describe not only coverage but also how recommended practices are operationalized. The current pilot similarly points toward workflow-dependent elements. It also highlights that a nearly perfect global score can coexist with specific gaps that deserve targeted improvement.

The findings have immediate value for audit design. First, item definitions should specify observable criteria and timing. Second, observers should record performed and documented as distinct dimensions, with clear categories for partial care, clinical contraindication, and inability to assess. Third, at least 10% of episodes should be independently rated to estimate interobserver agreement. Fourth, qualitative interviews should purposively include facilities or shifts with contrasting compliance patterns so that explanations are grounded in quantitative variation. These steps would fulfill the sequential explanatory logic of the original proposal.

A further quality-improvement implication concerns feedback. Aggregate audit results are most useful when translated into a small number of feasible actions with named owners and a reassessment date. For example, a facility could select resuscitation readiness, early breastfeeding documentation, and protection of uninterrupted skin-to-skin

contact as a three-month improvement bundle. Baseline definitions should remain unchanged during the cycle so that re-audit results are comparable. Feedback should avoid ranking individual providers; instead, it should examine whether room layout, staffing, documentation forms, supply management, and escalation procedures make the standard action easy to perform consistently. This systems orientation is compatible with WHO quality standards, which link competent clinical processes with an enabling care environment (WHO, 2016).

The pilot also offers lessons for instrument validity. Several items combined performance and documentation within one statement, such as giving an intervention and recording it. A single response may therefore be difficult to interpret when care was provided but not documented. The revised audit should either separate these dimensions or provide explicit scoring anchors for each combination. Cognitive testing with midwives can determine whether response categories are understood consistently, while expert review can assess content relevance. During field testing, observers should document the reason for every partial score. These notes can reveal whether partial performance reflects timing, incomplete duration, missing counseling, absent documentation, or a justified modification for maternal or newborn condition.

A strength of this analysis is the transparent reconciliation of the available dataset with the planned protocol. Rather than presenting provider responses as observed newborn episodes, the manuscript preserves the correct unit of analysis and labels the evidence as pilot data. The scoring algorithm also excluded clinically non-applicable and unassessable items from denominators, preventing these categories from being counted automatically as

failures. Reporting both composite achievement and full item compliance provided complementary views: the former credited partial performance, whereas the latter highlighted components that did not fully meet the stated standard. This approach made the priority pattern visible despite a highly concentrated overall score.

This study has several limitations. The sample consisted of only 32 respondents and did not achieve the proposed minimum of 107 newborn episodes. Respondents were distributed across multiple regions rather than restricted to Kediri. Sampling procedures and response rates could not be reconstructed from the spreadsheet. The data were self-reported and lacked direct observation, record verification, facility-readiness measures, workload, shift, birth mode, newborn condition, provider profession, and length of service. No qualitative transcripts were available. The exploratory tests were underpowered and no multivariable analysis was appropriate. Finally, the ceiling effect may indicate both genuinely high reported practice and limited discriminative ability of the instrument. These limitations restrict generalizability but do not eliminate the pilot's usefulness for identifying priority items and refining the full audit.

5. CONCLUSION

Self-reported compliance with essential newborn care was high in this 32-respondent pilot dataset, with a mean composite score of 97.50%. The most consistent opportunity for improvement involved skin-to-skin contact and early breastfeeding, particularly documentation of initiation time or outcome, recognition of feeding readiness cues, and uninterrupted contact. Resuscitation-equipment checks, selected thermal-care actions, and family education also require attention. No significant group differences were detected, but the small and

highly skewed sample precludes conclusions of equivalence. The results should be used as preliminary evidence to refine the instrument and prioritize an episode-based clinical audit rather than as a prevalence estimate for Kediri facilities.

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