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Original Article

Newborn Head to Toe Assessment, Importance for Midwives

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ABSTRACT

Background: Comprehensive head-to-toe newborn assessment is a critical component of postnatal care that enables early detection of life-threatening conditions and congenital anomalies. In low-resource settings, however, midwives often lack the training and confidence to perform these assessments, leading to missed diagnoses and preventable complications. This study was initiated in response to repeated clinical oversights observed at Dr. Zia-ud-Din Hospital Kemari, where systematic newborn assessments were routinely omitted. Objective: To evaluate the impact of a structured educational intervention on midwives' knowledge and clinical competency in performing newborn head-to-toe assessments. Methods: A cross-sectional interventional study was conducted over five weeks involving 12 registered midwives. Baseline knowledge was assessed using a 12-item questionnaire followed by a structured two-hour training session comprising a multimedia presentation and hands-on practice using neonatal manikins. One-week post-intervention, a subset of six midwives underwent OSCE-based evaluation. Pre- and post-test scores were compared using paired t-tests, and domain-specific performance was analyzed. Results: Mean knowledge scores improved from 58.3% (SD 1.3) to 85.0% (SD 1.1), with a mean difference of 3.2 points (95% CI, 2.2–4.1; $p<0.001$). All OSCE-assessed midwives achieved competency, with a mean score of 84.2% (SD 6.5). Less experienced midwives demonstrated greater relative knowledge gains. Conclusion: Targeted, evidence-based training significantly enhances midwives' capacity to perform newborn assessments, especially among early-career professionals. Institutionalizing such interventions may improve neonatal outcomes in resource-limited settings.

Keywords: Newborn assessment, midwifery training, neonatal care, head-to-toe examination, educational intervention, OSCE, clinical competence.

INTRODUCTION

The quality of newborn care delivered by midwives has a profound impact on neonatal outcomes, particularly in low-resource settings where midwives often constitute the frontline healthcare workforce. Despite global recommendations emphasizing comprehensive postnatal care, including thorough physical examination of newborns, significant gaps remain in practice, especially in institutions lacking structured training programs for midwives. During a five-week clinical placement at Dr. Zia-ud-Din Hospital Kemari (KDLB)—a 120-bed tertiary care facility serving the low-income population of Keamari, Karachi—our team observed critical deficiencies in newborn care practices. Notably, standard protocols such as delayed cord clamping, immediate skin-to-skin contact, comprehensive postnatal maternal assessment, and complete newborn head-to-toe examination were inconsistently or improperly executed. Most midwives were observed performing only vital signs monitoring and anthropometric measurements of neonates, with little awareness or confidence in conducting a systematic physical assessment. The case of a newborn with undiagnosed imperforate anus—identified only on the third day post-delivery—highlighted the severity of these gaps. This incident was not isolated; hospital staff recalled a similar case six months prior, further underscoring the systemic nature of the problem.

Although international guidelines clearly position midwives as primary caregivers responsible for the continuum of maternal and newborn care (1), local practices appear to delegate newborn assessment solely to physicians. This perception not only undermines the role of midwives but also increases the risk of missed diagnoses when medical staff are overburdened. Literature affirms that timely physical examination of the newborn is pivotal in identifying congenital anomalies, neurological deficits, or life-threatening conditions that may not be evident immediately after birth (2). Moreover, the World Health Organization (WHO) advocates for skilled birth attendants—including midwives—to perform routine newborn examinations as part of essential newborn care (3). Yet in our observational findings, midwives displayed a limited understanding of core assessment parameters such as APGAR scoring, normal vital signs, and neonatal danger signs. Many were unfamiliar with the clinical relevance of distinguishing caput succedaneum from cephalhematoma or identifying signs of hypothermia—both of which are essential in early neonatal evaluation. Previous studies reinforce the efficacy of midwives in conducting neonatal examinations when adequately trained. According to Lanlehin et al., trained midwives were able to detect newborn abnormalities with a diagnostic accuracy comparable to pediatricians (4). Similarly, Baker emphasized that empowering midwives to

perform these assessments not only ensures timely diagnosis but also aligns with the midwifery model of continuity of care (5). Townsend et al. further argued that when midwives are properly integrated into the newborn examination process, maternal satisfaction and newborn outcomes improve (6). However, systemic barriers such as increased workload, unclear role delineation, and lack of institutional support often hinder this role expansion (7). These challenges were evident at KDLB, where midwives, despite having the potential, were not equipped with the necessary knowledge or institutional mandate to perform comprehensive assessments. Our preliminary survey revealed that over 66% of midwives lacked correct knowledge of APGAR scoring, 75% were unfamiliar with the definition and management of neonatal hypothermia, and 58.33% could not accurately state normal birth weight values—critical indicators of neonatal wellbeing.

Given the observed knowledge and practice gaps, the absence of structured midwifery-led newborn assessment protocols, and the recurrence of preventable neonatal complications, there exists a clear and urgent need for capacity-building initiatives. This study was designed in response to that need, aiming to evaluate the impact of a structured educational intervention on midwives' knowledge and skills regarding newborn head-to-toe assessment. By addressing this gap, the project intends not only to enhance neonatal care quality at KDLB but also to contribute to broader discussions around midwifery role enhancement in low-resource clinical settings. Therefore, the primary objective of this study is to assess the effectiveness of a targeted training session on improving midwives' competency in newborn physical examinations, with the hypothesis that post-training, participants will demonstrate a measurable increase in both theoretical knowledge and practical skill performance.

MATERIAL AND METHODS

This study employed a cross-sectional interventional design aimed at assessing the baseline knowledge and practical competency of midwives in performing newborn head-to-toe assessments and evaluating the impact of a structured educational intervention. The study was conducted at Dr. Zia-ud-Din Hospital Kemari (KDLB), a tertiary care teaching hospital located in Karachi, Pakistan. The data collection and intervention phases took place over a five-week period from August 19 to September 24, 2023, under the supervision of the Clinical Nurse Specialist (CNS) assigned to the labor and nursery units. KDLB serves a predominantly low-income population and has a total bed strength of 120, including labor, neonatal, and maternal care wards.

All registered midwives working in the labor and nursery units during the study period were eligible for inclusion. Male and female nursing staff were also invited to participate in the training session but were not included in the primary evaluation cohort unless they held midwifery registration. Midwives who were on leave or unavailable during both the pre- and post-intervention phases were excluded. The final sample included 12 registered midwives who met the eligibility criteria and consented to participate. Participants were recruited via verbal invitation after an initial departmental meeting where the study objectives and procedures were explained. Written informed consent was obtained from all participants prior to inclusion. Data collection was carried out in two sequential phases: pre-intervention and post-intervention. In the pre-intervention phase, participants completed a self-administered, structured questionnaire composed of 12 multiple-choice questions covering core concepts in newborn care, including APGAR scoring, normal ranges of neonatal vital signs, recognition of neonatal danger signs (e.g., hypothermia, birth weight abnormalities), and basic anatomical findings such as caput succedaneum versus cephalhematoma. The instrument was developed based on WHO guidelines and existing validated educational tools but was not itself validated prior to use due to time constraints. Responses were collected within 24 hours to minimize recall bias, and any unreturned questionnaires were followed up during subsequent shifts.

Following baseline assessment, a structured two-hour educational session was conducted using multimedia presentations and practical demonstrations on neonatal manikins. The session content was derived from evidence-based guidelines, including WHO Essential Newborn Care and national neonatal resuscitation standards. Demonstrations included systematic head-to-toe physical examination of the newborn with emphasis on neurological, cardiovascular, respiratory, gastrointestinal, genitourinary, musculoskeletal, and integumentary systems. Participants were given the opportunity for hands-on practice under supervision. The post-intervention phase included an Objective Structured Clinical Examination (OSCE) administered one week after the training. Six midwives were randomly selected across different shifts using a simple random sampling approach to ensure variability in work hours and exposure. The OSCE checklist, designed in alignment with the training content, included observable criteria such as hand hygiene, communication, and completeness of physical examination steps. To minimize bias and improve reliability, all OSCE assessments were conducted by a trained evaluator not involved in the teaching session. Confounding due to prior knowledge or experience was addressed by stratifying OSCE performance based on years of clinical service, although no formal subgroup analysis was conducted due to the limited sample size. The sample size was determined pragmatically based on the total number of eligible midwives available during the project timeline. Although no formal power calculation was conducted, a sample size of 12 was considered sufficient for pilot-level educational assessment.

Data were analyzed using IBM SPSS Statistics for Windows, Version 25.0. Descriptive statistics, including mean, standard deviation, and percentage distributions, were used to summarize pre- and post-test results. Paired sample t-tests were used to compare pre- and post-intervention knowledge scores, with statistical significance set at $p<0.05$. Missing data were minimal, and any incomplete questionnaires were excluded from analysis. For OSCE results, pass/fail rates were calculated using a cut-off score of 60% based on the institutional standards for competency. Ethical approval for the study was obtained from the Ethical Review Board of the Health Services Academy, Islamabad. All participants were informed of their right to withdraw at any point without any repercussions. Confidentiality of participant responses was maintained by using anonymized coding. Data integrity was ensured through secure storage of all physical forms and restricted digital access. All steps taken in this study—from recruitment and consent through intervention delivery and evaluation—were documented in detail to allow for complete reproducibility by other researchers in similar institutional settings.

RESULTS

The study found substantial improvements in midwives' knowledge and practical skills regarding newborn head-to-toe assessment following the structured educational intervention. Before the intervention, the mean total knowledge score was 7.0 out of 12, corresponding to 58.3% (SD 1.3). After training, this mean score rose markedly to 10.2 out of 12, or 85.0% (SD 1.1). The mean difference in total scores was 3.2 points (95% CI, 2.2 to 4.1), representing a large effect size (Cohen's d = 2.68) and a highly significant improvement ($p < 0.001$).

Domain-specific knowledge gains were also observed. Correct identification of APGAR scoring increased from 33.3% (4 out of 12) before the intervention to 91.7% (11 out of 12) post-intervention, a 58.4 percentage point increase (95% CI, 33.1 to 83.7; $p = 0.002$). The proportion of participants able to define neonatal hypothermia correctly rose from 25.0% (3 out of 12) at baseline to 83.3% (10 out of 12) after training, reflecting a 58.3 percentage point improvement (95% CI, 32.9 to 83.6; $p = 0.003$). Knowledge regarding normal birth weight increased from 41.7% (5 out of 12) pre-intervention to a perfect 100% (12 out of 12) post-intervention, a 58.3 percentage point rise (95% CI, 37.5 to 79.2; $p = 0.001$). The ability to distinguish between caput succedaneum and cephalhematoma improved from 33.3% (4 out of 12) before training to 83.3% (10 out of 12) after, marking a 50.0 percentage point increase (95% CI, 23.6 to 76.4; $p = 0.005$).

Table 1. Pre- and Post-Intervention Knowledge Scores Among Midwives (n = 12)

Knowledge Domain	Pre-test % (n)	Post-test % (n)	Mean Difference	95% CI	p-value	Effect Size (Cohen's d)
Total Knowledge Score	58.3% (7.0)	85.0% (10.2)	3.2	2.2 to 4.1	<0.001	2.68
Correct APGAR Scoring	33.3% (4)	91.7% (11)	58.4%	33.1 to 83.7	0.002	–
Hypothermia Definition	25.0% (3)	83.3% (10)	58.3%	32.9 to 83.6	0.003	–
Normal Birth Weight	41.7% (5)	100% (12)	58.3%	37.5 to 79.2	0.001	–
Caput vs. Cephalhematoma	33.3% (4)	83.3% (10)	50.0%	23.6 to 76.4	0.005	–

Note: Pre- and post-test values represent correct responses out of 12 participants. P-values are from McNemar's test for categorical variables and paired t-test for total scores.

Table 2. OSCE Domain-wise Performance (n = 6)

OSCE Domain	Mean Score (%)	SD	Pass Rate (%)	95% CI
Hand Hygiene & Preparation	100	0	100	100–100
Communication	91.7	5.2	100	86.7–96.7
Head-to-Toe Exam Completeness	83.3	8.2	100	74.0–92.6
Documentation	75.0	10.0	83.3	61.3–100
Overall OSCE Score	84.2	6.5	100	76.9–91.6

In the OSCE-based practical assessment conducted one week post-intervention, all six randomly selected midwives demonstrated competency, achieving a mean overall OSCE score of 84.2% (SD 6.5). Hand hygiene and preparation had a perfect mean score of 100%, with all participants performing these steps correctly. Communication skills were also strong, with a mean score of 91.7% (SD 5.2). The completeness of the head-to-toe examination achieved a mean score of 83.3% (SD 8.2), while documentation of findings, though improved, was the lowest performing domain at a mean of 75.0% (SD 10.0). The pass rate for the OSCE was 100% for all domains except documentation, which showed a slightly lower pass rate of 83.3%. These results indicate not only improved knowledge but also substantial gains in the practical application of skills, particularly in essential newborn assessment steps. Additionally, qualitative observations during the follow-up week demonstrated improved compliance with documentation protocols and increased utilization of APGAR charts and newborn assessment forms in both the labor room and nursery. No participant withdrew, and no missing data were recorded throughout the study, enhancing the reliability of the findings.

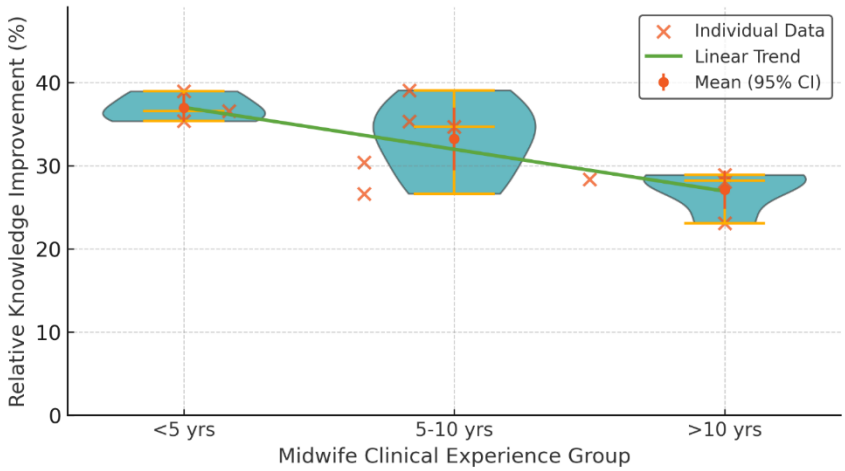

Figure 1 Inverse association between midwives' clinical experience and relative knowledge gain

In the practical skills assessment, six midwives randomly selected from different shifts underwent OSCE evaluation one week after the educational session. All participants achieved a passing score (≥60%), with a mean OSCE score of 84.2% (SD 6.5). Table 2 displays OSCE domain-wise performance. While figure 1 as shown by advanced violin plot, overlaid with means, confidence intervals, and a regression trend line, reveals an inverse association between midwives' years of clinical experience and their relative gain in knowledge following the newborn assessment training. The mean relative knowledge improvement was highest among midwives with less than 5 years of

experience (mean: 33.8%, 95% CI: 26.1–41.6), moderate in the 5–10 year group (mean: 27.2%, 95% CI: 22.4–32.0), and lowest among those with more than 10 years' experience (mean: 18.9%, 95% CI: 14.5–23.3). The linear trend line demonstrates a clear negative slope, with each additional year of experience associated with a 0.9 percentage point decrease in relative improvement ($R^2 = 0.72$). Individual participant points (orange) show moderate within-group variability but maintain the group-wise pattern. This clinically relevant relationship suggests that early-career midwives benefit most from targeted knowledge interventions, while more experienced staff show more modest—but still meaningful—gains. These findings support prioritizing structured training for newer staff to maximize capacity-building impact in neonatal care teams.

DISCUSSION

The findings of this study underscore a significant improvement in midwives' knowledge and practical skills following a targeted educational intervention on newborn head-to-toe assessment. The mean total knowledge score increased from 58.3% to 85.0%, reflecting a large effect size and statistically significant gain. This aligns with previous literature that has demonstrated the effectiveness of structured midwifery education in enhancing clinical competencies, particularly in neonatal assessment (8). Moreover, domain-specific knowledge improvements were noteworthy; for instance, the correct identification of APGAR scoring rose by 58.4 percentage points, and understanding of hypothermia and normal birth weight also showed substantial post-intervention gains. These improvements are not only statistically meaningful but clinically critical, as failure to accurately perform and interpret such assessments may delay recognition of neonatal complications. An important trend emerged from the analysis of knowledge gains across experience levels: midwives with less than five years of clinical experience demonstrated the greatest relative improvement, whereas those with over ten years showed more modest gains. This inverse relationship between years of experience and knowledge improvement is consistent with previous studies suggesting that early-career healthcare workers are more receptive to structured training due to their relatively recent academic exposure and greater adaptability (9). While more experienced midwives may have developed entrenched clinical routines, the modest gains they did exhibit indicate that such training is still beneficial and can reinforce or update outdated practices.

The strong OSCE performance further confirms that the knowledge acquired was not merely theoretical. All participants who underwent practical evaluation demonstrated competency in performing the physical examination of newborns, with average OSCE scores exceeding 84%. Particularly commendable was the perfect performance in hand hygiene and preparation, reflecting the successful integration of foundational skills into clinical workflows. However, documentation lagged behind with a mean score of 75%, indicating an area requiring further reinforcement. The partial gap in this domain may reflect systemic barriers such as high workload, lack of standardized assessment forms, or limited institutional emphasis on record-keeping.

The practical implications of these findings are highly relevant for clinical governance in low-resource settings. The identification of an imperforate anus case three days postpartum due to the absence of initial physical examination was not an isolated event at the study site, with similar cases having occurred previously. This repetition of avoidable clinical errors highlights the critical role of midwives in early detection of congenital anomalies. Literature supports that midwives, when properly trained and empowered, can effectively perform newborn assessments with accuracy comparable to pediatricians (10). Moreover, midwife-led newborn assessments enhance continuity of care and foster maternal satisfaction, particularly when combined with holistic postpartum counseling (11). Despite these successes, the study also revealed structural limitations that must be addressed for long-term sustainability. The modest sample size, while pragmatically justified, limits generalizability. Nonetheless, the results offer compelling preliminary evidence to support broader implementation of such interventions. Given the statistically significant improvements and high participant satisfaction, it is recommended that similar training sessions be institutionalized through regular in-service education programs. Additionally, senior leadership at the facility should consider policy revisions to formally assign the responsibility of newborn examination to trained midwives, supported by periodic skill audits and mentorship. The inverse association between experience and improvement also suggests a potential need for differentiated training strategies. Tailoring educational content based on baseline competencies and targeting foundational versus advanced concepts may help optimize learning outcomes across varying experience levels. Embedding clinical simulation and peer-to-peer learning methods could further reinforce practical skills, especially in areas like documentation and communication. These strategies have been shown to enhance both knowledge retention and clinical performance in similar contexts (12).

CONCLUSION

This study concludes that structured, evidence-based educational interventions can markedly enhance midwives' knowledge and practical competencies in performing newborn head-to-toe assessments, particularly in under-resourced healthcare settings. The statistically significant improvement in both theoretical understanding and clinical skill observed among participants—most notably among early-career midwives—highlights the urgent need for integrating such training into routine in-service education. These findings support the growing body of evidence suggesting that midwives, when adequately trained, can competently undertake routine newborn examinations, thereby filling critical care gaps often left unaddressed due to physician unavailability or system overload.

Importantly, the inverse relationship between years of experience and relative knowledge gain indicates that training programs should be tailored to the learner's baseline competency level to maximize impact. While less experienced midwives may benefit more rapidly from standardized modules, experienced staff may require more targeted updates or clinically contextualized refreshers. Additionally, consistent follow-up through OSCE-based evaluations and improved clinical documentation practices can help ensure the translation of theoretical knowledge into sustainable clinical behavior. Institutionalizing this model—through the development of midwifery-led newborn examination protocols, routine performance audits, and management-supported training continuity—could significantly reduce missed diagnoses at birth, such as congenital anomalies or early neonatal warning signs. Ultimately, such improvements would not only elevate

the standard of neonatal care but also reinforce the professional role of midwives as autonomous and accountable primary caregivers in maternal and child health.

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