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Comprehensive midwifery care for a premature newborn with very low birth weight and grade III–IV hyaline membrane disease: A case report

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Abstract:

Prematurity, very low birth weight (VLBW), and respiratory distress syndrome (RDS, also called hyaline membrane disease, HMD) are neonatal emergencies that need immediate, comprehensive, and collaborative management. This case report describes the midwifery care of a 0-day-old premature newborn with VLBW and grade III–IV HMD in the Neonatal Care Unit of Gambiran General Hospital, Kediri, Indonesia, from 16 to 28 June 2025, and is reported according to the CARE guideline. Care was documented with Varney's seven-step management process and SOAP progress notes, using direct observation, interviews, and medical records. The infant was born at less than 32 weeks of gestation with a birth weight below 1,500 g, did not cry spontaneously, and showed tachypnea, chest retractions, grunting, and cyanosis, with low APGAR scores. Care comprised resuscitation, oxygen therapy, intratracheal surfactant, continuous positive airway pressure (CPAP), vital-sign monitoring, thermoregulation, parenteral nutrition, and parent education, delivered in collaboration with pediatricians and NICU nurses. Oxygen saturation increased, chest retractions became less frequent, and a sucking reflex gradually emerged. As a single case, these observations cannot establish causal effects. They illustrate how midwives can contribute to early recognition, stabilization, thermal protection, nutritional support, and family-centered care within a multidisciplinary neonatal team, and they point to the need for more complete clinical reporting.

Keywords:
prematurity; VLBW; HMD; midwifery care; neonatal

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INTRODUCTION

Neonatal health is an important indicator of the quality of maternal and child healthcare. The first week of life is particularly critical for preterm infants and those with very low birth weight (VLBW; less than 1,500 g). An estimated 14.9 million babies were born preterm in 2010, accounting for 11.1% of live births worldwide (Blencowe et al., 2012). Complications of preterm birth remain a leading cause of neonatal and under-five mortality (Liu et al., 2016; Perin et al., 2022). Improving

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outcomes therefore requires timely and appropriate care, particularly for the smallest and most vulnerable newborns.

Respiratory distress syndrome (RDS), also known as hyaline membrane disease (HMD), is a common complication of prematurity. Surfactant deficiency and immature lungs cause alveolar collapse, reduced lung compliance, and impaired gas exchange, potentially leading to respiratory failure (Sweet et al., 2023). The risk of severe RDS increases as gestational age and birth weight decrease. A nationwide Korean cohort found that lower gestational age, male sex, cesarean delivery, maternal hypertensive disorders, and low 5-minute Apgar scores were associated with refractory RDS requiring repeated surfactant doses in VLBW infants (Shin et al., 2024). Severe HMD therefore requires prompt assessment and coordinated management from birth.

Management of RDS includes antenatal corticosteroids, respiratory support, surfactant therapy, and thermal protection. Antenatal corticosteroids promote fetal lung maturation when preterm birth is anticipated (McGoldrick et al., 2020). After birth, early continuous positive airway pressure (CPAP) can support breathing and reduce the need for invasive ventilation (Subramaniam et al., 2021). Surfactant may be administered prophylactically or as early rescue treatment, depending on the infant's condition and clinical guidelines (Rojas-Reyes et al., 2012; Abdel-Latif et al., 2021). Maintaining normal body temperature is equally important because both hypothermia and hyperthermia are associated with adverse outcomes in preterm infants (Lyu et al., 2015; Laptook et al., 2018). Neonatal resuscitation guidelines emphasize effective positive-pressure ventilation and prevention of hypothermia as priorities during initial stabilization (Aziz et al., 2020). These interventions are also central to current European recommendations for RDS management (Sweet et al., 2023).

Beyond respiratory management, VLBW infants require careful monitoring, nutritional support, infection prevention, and ongoing assessment of clinical progress. Midwives contribute by monitoring vital signs, maintaining body temperature, assessing feeding tolerance, documenting changes, and communicating with the neonatal team. Breast milk supports nutrition and growth when feeding is clinically appropriate. Kangaroo mother care can reduce mortality, severe infection, and hypothermia among low-birth-weight infants (Conde-Agudelo & Díaz-Rossello, 2016). Family-integrated care has also been associated with improved infant weight gain and reduced parental stress and anxiety (O'Brien et al., 2018). These interventions should be introduced according to the infant's stability and the clinical team's assessment.

Midwives play an important role in newborn care through early assessment, prevention of complications, family support, and coordination with other healthcare professionals (Renfrew et al., 2014). The World Health Organization (2022) also provides guidance for improving care for small and sick newborns in health facilities. For critically ill preterm infants, effective teamwork is essential because respiratory support, surfactant administration, and management of complications require coordinated medical and nursing care. A structured approach, such as Varney's management process, can help organize assessment, identify problems, plan interventions, and evaluate outcomes. However, detailed reports describing the application of structured midwifery care in critically ill preterm infants in Indonesian hospitals remain important for clinical learning.

This case report describes the comprehensive midwifery care of a premature VLBW newborn with grade III–IV HMD at Gambiran General Hospital, Kediri, Indonesia, using

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Varney's management process. It also discusses the care provided in relation to current evidence on neonatal resuscitation, respiratory support, thermal protection, nutritional management, and family-centered care (Aziz et al., 2020; Sweet et al., 2023; World Health Organization, 2022).

Despite advances in neonatal care, managing severe HMD in VLBW infants remains challenging, particularly because these infants require continuous monitoring and coordinated multidisciplinary care. Midwives play an important role in supporting stabilization, maintaining thermal balance, monitoring clinical responses, and educating families. A structured management approach can help ensure that these responsibilities are carried out systematically and in line with current guidelines (Renfrew et al., 2014; Sweet et al., 2023; World Health Organization, 2022). This case report aims to describe the comprehensive midwifery care of a premature VLBW newborn with grade III–IV HMD at Gambiran General Hospital, Kediri, Indonesia, using Varney's seven-step management model, and to discuss the care provided in relation to current evidence and clinical recommendations.

METHODS

This was a descriptive single-case study with a comprehensive midwifery care approach. The aim was to describe in depth the process and outcome of midwifery care for a newborn with prematurity, VLBW, and grade III–IV HMD. The report follows the CARE guideline for case reports (Gagnier et al., 2013).

The study took place in the Neonatal Care Unit (Panji Room) of Gambiran General Hospital, Kediri City, East Java, Indonesia, from 16 to 28 June 2025. The participant was a 0-day-old newborn of Mrs. N.F., born at less than 32 weeks of gestation with a birth weight below 1,500 g, and diagnosed with prematurity, VLBW, and grade III–IV HMD. The subject of the study was the infant, and the object of study was the midwifery care process provided to the infant.

Prematurity was defined as birth before 37 completed weeks of gestation, VLBW as a birth weight below 1,500 g, and RDS (HMD) as respiratory distress in a preterm infant caused by surfactant deficiency, graded III–IV by the treating team. The case was selected for in-depth description because it illustrates the midwifery management of a critical neonatal emergency requiring close collaboration with the medical team.

Four sources of data were used. First, direct observation of the infant's condition, including respiratory status, color, vital signs, temperature, and feeding. Second, interviews with family members and with the health professionals who cared for the infant. Third, review of the medical record. Fourth, a review of the literature to support interpretation of the findings and the choice of management. Comparing the four sources allowed each finding to be checked against at least one other source. The infant was observed from admission to the unit through the end of the study period, and observations were documented in the SOAP notes at each assessment.

The instruments were maternal and neonatal assessment forms, a midwifery management format based on Varney's seven steps (data collection, interpretation of data, identification of potential diagnoses or problems, immediate action and collaboration, planning, implementation, and evaluation) (Varney et al., 2004), and progress notes in the SOAP (Subjective, Objective, Assessment, Plan) format. Medical management, including resuscitation, intratracheal surfactant,

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oxygen, and CPAP, was delivered by the pediatric and NICU team according to hospital protocol. The independent midwifery interventions were monitoring vital signs, preventing hypothermia, providing nutritional support, and educating the parents about the infant's condition and care.

Data analysis. The data were analyzed descriptively and qualitatively. Findings from assessment, diagnosis, interventions, implementation, and evaluation were arranged in chronological order, summarized according to Varney's steps (Tables 1 and 2), and compared with current guidelines and published evidence (Aziz et al., 2020; Sweet et al., 2023; World Health Organization, 2022). No inferential statistics were used because the report describes a single case. The infant and mother are identified by initials only, and no other identifying information is reported.

RESULTS

The infant of Mrs. N.F. was delivered prematurely at less than 32 weeks of gestation with a birth weight below 1,500 g. At birth, the infant did not cry spontaneously and showed tachypnea, chest wall retractions, grunting, and cyanosis, which are typical signs of HMD. The APGAR scores at the first and fifth minutes were low, and the medical team resuscitated the infant immediately. The infant was then transferred to the NICU and diagnosed with grade III–IV HMD. Table 1 summarizes the clinical profile at presentation.

Table 1. Clinical profile of the infant at presentation

Parameter	Finding
Patient	0-day-old newborn of Mrs. N.F.
Gestational age	<32 weeks
Birth weight	<1,500 g (VLBW)
Cry at birth	No spontaneous cry
Respiratory signs	Tachypnea, chest wall retractions, grunting, cyanosis
APGAR score, 1 and 5 minutes	Low
Diagnosis	Premature newborn with VLBW and grade III–IV HMD (RDS)

Table 2. Midwifery care process for the infant according to Varney's seven steps

Varney step	Findings and care provided
1. Data collection	Premature newborn (<32 weeks), birth weight <1,500 g, no spontaneous cry, tachypnea, chest retractions, grunting, cyanosis, low 1- and 5-minute APGAR scores.
2. Interpretation of data	Premature VLBW newborn with grade III–IV HMD (RDS) who needed resuscitation and intensive respiratory support.
3. Potential problems	Risk of respiratory failure and hypoxemia, hypothermia, and inadequate nutrition.
4. Immediate action and collaboration	Resuscitation by the medical team, transfer to the NICU, and collaboration with the pediatrician and NICU nurses.
5. Planning	Oxygen therapy, intratracheal surfactant, CPAP, monitoring of vital signs, thermoregulation, parenteral nutrition, and parent education.
6. Implementation	Collaborative: oxygen, surfactant, and CPAP. Independent: vital-sign monitoring, prevention of hypothermia, parenteral feeding, and education of the parents.

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7. Evaluation	Increased oxygen saturation, reduced frequency of chest retractions, and gradual emergence of a sucking reflex.

Care was organized according to Varney's seven steps (Table 2). Collaborative actions with the pediatrician and NICU nurses secured advanced medical management: oxygen therapy, intratracheal surfactant, and CPAP. The independent midwifery interventions were monitoring vital signs, preventing hypothermia, providing nutrition via parenteral feeding, and educating the parents about the infant's condition and ongoing care. Evaluation during the care period showed gradual improvement in the infant's condition. Oxygen saturation increased, chest retractions became less frequent, and a sucking reflex gradually emerged.

DISCUSSION

This case describes a very low birth weight (VLBW) preterm infant with grade III–IV hyaline membrane disease (HMD) who required resuscitation, surfactant, and continuous positive airway pressure (CPAP). The infant gradually improved with medical treatment and midwifery care. This case highlights the importance of teamwork, with medical staff managing respiratory support and midwives providing assessment, monitoring, thermal care, nutritional support, and family education. Although oxygen saturation, chest retractions, and the sucking reflex improved, these observations from a single case cannot establish the effectiveness of any specific intervention.

Prematurity before 32 weeks and birth weight below 1,500 g are major risk factors for respiratory distress syndrome (RDS), mainly because of lung immaturity and surfactant deficiency (Sweet et al., 2023). Low 5-minute Apgar scores have also been associated with refractory RDS in VLBW infants (Shin et al., 2024). However, Apgar scores alone cannot diagnose birth asphyxia or predict long-term outcomes (American Academy of Pediatrics Committee on Fetus and Newborn, 2015). Clinical assessment and additional evidence, such as acid–base status, are needed to support this diagnosis. Accurate documentation is therefore essential.

Effective ventilation and thermal protection are priorities during neonatal resuscitation (Aziz et al., 2020). Admission temperatures between 36.5 °C and 37.2 °C have been associated with better outcomes in preterm infants, while both hypothermia and hyperthermia increase risks (Lyu et al., 2015). Similar associations between admission temperature and mortality have been reported in moderately and extremely preterm infants (Laptook et al., 2018). Midwives play an important role in maintaining a warm environment, covering the infant, and monitoring temperature. These measures are essential components of neonatal care.

Respiratory support and surfactant therapy are central to managing severe HMD. Early CPAP can reduce bronchopulmonary dysplasia (BPD) and the combined risk of death or BPD compared with mechanical ventilation in preterm infants (Subramaniam et al., 2021). European guidelines recommend early non-invasive respiratory support and rescue surfactant when indicated (Sweet et al., 2023). Studies have also compared different surfactant strategies (Rojas-Reyes et al., 2012). Administration through a thin catheter may reduce death or BPD compared with endotracheal intubation, surfactant administration, and immediate extubation (Abdel-Latif et al., 2021). In this case, the surfactant technique was not fully documented, limiting comparison with

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these approaches. Antenatal corticosteroids also promote fetal lung maturation when preterm birth is anticipated (McGoldrick et al., 2020); their use should therefore be recorded in future reports.

Nutritional support is another important aspect of care. The infant initially received parenteral nutrition, while the development of a sucking reflex suggested increasing readiness for oral feeding. However, the optimal rate of advancing enteral feeds in VLBW infants remains uncertain, and slower advancement has not clearly reduced necrotizing enterocolitis (Oddie et al., 2017). Feeding should follow clinical protocols and the infant's tolerance. Midwives can support nutritional care by monitoring feeding tolerance, abdominal signs, and weight, while encouraging breast milk expression when appropriate.

Family involvement is also essential. Kangaroo mother care reduces mortality, severe infection, and hypothermia among low-birth-weight infants (Conde-Agudelo & Díaz-Rossello, 2016). Family-integrated care has also been associated with improved weight gain and reduced parental stress and anxiety (O'Brien et al., 2018). Once the infant is stable, midwives can prepare parents for kangaroo care, explain the infant's condition, and support family participation in care (Renfrew et al., 2014). Because survivors of severe HMD remain at risk of BPD, discharge planning should include appropriate follow-up (Jobe & Bancalari, 2001).

Overall, this case supports a practical sequence of care: identify preterm birth risks and arrange referral to an appropriate facility (World Health Organization, 2022); provide effective resuscitation and thermal protection (Aziz et al., 2020; Lyu et al., 2015); initiate respiratory support and surfactant when indicated (Subramaniam et al., 2021; Sweet et al., 2023); maintain nutrition and monitor growth (Oddie et al., 2017); and involve families through education and kangaroo mother care when appropriate (Conde-Agudelo & Díaz-Rossello, 2016; O'Brien et al., 2018). These coordinated measures are particularly important because complications of preterm birth remain a leading cause of child mortality worldwide (Perin et al., 2022).

This report is limited by its single-case design, incomplete clinical data, qualitative assessment, and lack of post-discharge follow-up. Therefore, improvement cannot be attributed to any single intervention, and the findings cannot be generalized. Nevertheless, the report demonstrates the value of structured care, guideline-based management, and clear teamwork. Future multicenter case reports using standardized documentation and outcome measures could strengthen evidence on neonatal care and the contribution of midwives in managing severe HMD.

In addition, clear documentation and timely communication are essential when caring for critically ill preterm infants. Recording respiratory status, oxygen saturation, temperature, feeding tolerance, and responses to treatment helps the team identify deterioration and adjust care promptly. Standardized handovers also reduce the risk of information being missed and support continuity across shifts. Midwives should communicate changes in the infant's condition to the neonatal team and ensure that parents receive consistent, understandable information. These practices are particularly important in facilities with limited resources, where early recognition and coordinated action can influence the quality of care.

Another important consideration is care after stabilization and discharge. Preterm infants with severe HMD may experience ongoing respiratory, nutritional, and developmental problems, requiring regular follow-up. Parents should receive guidance on feeding, maintaining a safe temperature, recognizing infection warning signs, and when to seek medical attention. Follow-up

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should also assess growth, respiratory health, and developmental progress. Integrating family education with multidisciplinary follow-up can support early detection of complications and improve continuity of care. Future studies should examine not only survival and respiratory outcomes but also growth, neurodevelopment, and family well-being to provide a more complete picture of recovery in VLBW infants.

CONCLUSION

Comprehensive midwifery care for a premature VLBW newborn with grade III–IV HMD required prompt, accurate, and collaborative management. In this case, resuscitation, oxygen, surfactant, and CPAP, together with midwifery monitoring, thermal protection, nutritional support, and parent education, were followed by gradual improvement in oxygen saturation, chest retractions, and sucking reflex. These findings come from a single case and show the contribution of midwives to early assessment, stabilization, and family-centered care within a multidisciplinary team. More complete reporting and further studies are needed to guide midwifery practice for critically ill preterm infants.

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DECLARATIONS

There is no conflict of interest

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