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# Distribution of Fifth-Minute APGAR Scores According to Birth Weight and Gestational Age Among Newborns: A Descriptive Cross-Sectional Study

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**Abstract**
The fifth-minute APGAR score is a widely used indicator of neonatal adaptation after birth. Birth weight and gestational age influence neonatal physiological maturity and may affect the transition to extrauterine life. Evidence describing the distribution of APGAR scores across these characteristics in primary healthcare settings remains limited. This study aimed to describe the distribution of fifth-minute APGAR scores according to birth weight and gestational age among newborns at Puskesmas Kerek, Tuban Regency. A descriptive cross-sectional study was conducted using secondary data from medical records. Fifty newborns were included through total sampling. Birth weight, gestational age, and fifth-minute APGAR scores were classified according to standard clinical criteria and analyzed using descriptive statistics. Among the newborns, 70.0% had normal birth weight, 24.0% had low birth weight, and 6.0% had macrosomia. Most were born at term (74.0%), while 20.0% were preterm and 6.0% were post-term. Normal fifth-minute APGAR scores were observed in 76.0% of newborns, whereas 20.0% had moderate scores and 4.0% had low scores. Lower APGAR scores were more frequently observed among low birth weight and preterm newborns. Most newborns had normal birth weight, term gestational age, and normal fifth-minute APGAR scores, underscoring the importance of careful neonatal assessment for infants with low birth weight and preterm birth.

***Keywords:*** *APGAR Score, Birth Weight, Gestational Age, Newborn, Neonatal Assessment.*



## 1. Introduction

The neonatal period represents a critical phase in human life because physiological adaptation to extrauterine existence occurs immediately after birth. During this period, newborns undergo rapid cardiopulmonary and metabolic adjustments that determine

their early survival and health outcomes. Therefore, accurate assessment of neonatal condition shortly after delivery is essential for identifying infants who require additional monitoring or intervention. One of the most widely used methods for evaluating newborn well-being is the APGAR score, which assesses heart rate, respiratory effort, muscle tone, reflex irritability, and skin color at one and five minutes after birth. The fifth-minute APGAR score is particularly important because it provides a more stable reflection of neonatal adaptation following initial resuscitative measures and has been associated with short-term and long-term neonatal outcomes(Leslie V, 2026)

A fifth-minute APGAR score of 7–10 is generally considered reassuring, whereas lower scores may indicate difficulties in neonatal adaptation and an increased risk of morbidity and mortality. Previous studies have reported that infants with low fifth-minute APGAR scores are more likely to experience respiratory complications, neurological impairment, admission to neonatal intensive care units, and neonatal death. Consequently, understanding factors associated with APGAR score variations remains important for improving neonatal care and reducing adverse outcomes(Getachew et al., 2020).

Birth weight is recognized as one of the factors that may influence neonatal condition at birth. Infants born with low birth weight often have immature physiological functions and reduced energy reserves, making adaptation to extrauterine life more challenging. Several studies have shown that low birth weight is associated with lower APGAR scores and a higher risk of neonatal complications. Conversely, infants with normal birth weight generally demonstrate better physiological stability immediately after delivery(Wang et al., 2024).

Gestational age is another important determinant of neonatal readiness for life outside the uterus. Preterm infants frequently exhibit immature respiratory, neurological, and cardiovascular systems that may compromise their ability to achieve optimal APGAR scores. In contrast, term infants usually have more mature organ function, enabling more effective adaptation after birth. Previous research has identified gestational age as a significant factor associated with fifth-minute APGAR scores and overall neonatal outcomes(Zakerihamidi et al., 2023).

Although the relationship between birth weight, gestational age, and neonatal outcomes has been widely discussed, descriptive data regarding the distribution of fifth-minute APGAR scores across different birth weight and gestational age categories remain limited in many local healthcare settings. Such information is valuable for healthcare providers, particularly midwives and neonatal practitioners, in identifying groups of newborns who may require closer observation during the early postnatal period.

Therefore, this study aimed to describe fifth-minute APGAR scores based on birth weight and gestational age among newborns. The findings are expected to provide evidence regarding neonatal adaptation patterns and contribute to improving neonatal assessment and monitoring practices in clinical settings.

## 2. Research Method

### 2.1 Study Design

This study employed a descriptive cross-sectional design to describe fifth-minute APGAR scores based on birth weight and gestational age among newborns. This design is appropriate for providing a snapshot of neonatal characteristics and outcomes during a defined study period and has been widely used in neonatal research conducted in health facilities (Khasawneh et al., 2020; Elhag et al., 2025).

The study was conducted using secondary data obtained from medical records of deliveries at the study site during the research period. The use of medical record review enables the collection of routinely documented neonatal variables, including gestational age, birth weight, and early neonatal outcomes, through structured data extraction procedures (Khasawneh et al., 2020; Desalegn et al., 2024).

### 2.2 Study Setting and Population

This study was conducted at Puskesmas Kerek, Tuban Regency, East Java, Indonesia. The study population comprised all newborns delivered at the health center during the study period, following the approach commonly used in facility-based neonatal studies that define the source population from all deliveries recorded within a specified time frame (Lungameni et al., 2023; Sangeetha et al., 2025).

Newborns with complete medical record data regarding birth weight, gestational age, and fifth-minute APGAR score were included in the study. This criterion is methodologically important to ensure that the main study variables can be analyzed consistently and to reduce bias related to incomplete documentation (Dueñas-Espín et al., 2025; Elhag et al., 2025). A total of 50 newborns met the eligibility criteria and were analyzed. Thus, the final sample represented all eligible newborn records available at the study site during the research period that fulfilled the inclusion criteria (Sangeetha et al., 2025; Lungameni et al., 2023).

### 2.3 Inclusion and Exclusion Criteria

#### 2.3.1 Inclusion criteria:

1. Newborns delivered during the study period.
2. Medical records containing complete data on birth weight, gestational age, and fifth-minute APGAR score.
3. Live-born infants.

#### 2.3.2 Exclusion criteria:

1. Medical records with incomplete or missing data.
2. Newborns with major congenital anomalies documented at birth

### 2.4 Sample and Sampling Technique

A total of 40 newborns were included in the study. Samples were selected using total sampling, whereby all newborn records that met the inclusion criteria during the study period were included in the analysis.

**Table 1.** Operational Definitions of Study Variables

| Variable | Operational Definition | Measurement Scale | Category |
|---|---|---|---|
| Birth Weight | The infant's weight measured immediately after birth and recorded in the medical record. | Ordinal | Low Birth Weight (LBW): < 2500 gNormal Birth Weight: 2500–3999 gMacrosomia: ≥ 4000 g |
| Gestational Age | The duration of pregnancy calculated from the first day of the last menstrual period or determined by obstetric assessment, expressed in completed weeks. | Ordinal | Preterm: < 37 weeksTerm: 37–41 weeksPost-term: ≥ 42 weeks |
| Fifth-Minute APGAR Score | Neonatal assessment score recorded at the fifth minute after birth based on heart rate, respiratory effort, muscle tone, reflex irritability, and skin color. | Ordinal | Low: 0–3Moderate: 4–6Normal: 7–10 |

### 2.5 Data Collection

Data were collected from medical records using a structured data extraction form. Information retrieved included birth weight, gestational age, and fifth-minute APGAR score. All data were anonymized prior to analysis to maintain participant confidentiality.

### 2.6 Data Analysis

Data were analyzed using descriptive statistics. Categorical variables were presented as frequencies and percentages, while numerical variables were summarized using means and standard deviations when appropriate. Cross-tabulation was performed to describe the distribution of fifth-minute APGAR scores according to birth weight and gestational age categories. Results were presented in tables and graphs to facilitate interpretation.

### 2.7 Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee of Universitas PGRI Adi Buana Surabaya with approval number 180-KEPK. The study utilized secondary data from medical records, and all personal identifiers were removed

to ensure confidentiality and privacy of participants. The research was conducted in accordance with ethical principles outlined in the Declaration of Helsinki.

## 3. Result

**Table 2**. Distribution of Newborns Based on Birth Weight

| Birth Weight Category | Frequency (n) | Percentage (%) |
|---|---|---|
| Low Birth Weight (<2500 g) | 12 | 24.0 |
| Normal Birth Weight (2500–3999 g) | 35 | 70.0 |
| Macrosomia (≥4000 g) | 3 | 6.0 |
| Total | 50 | 100.0 |

Table 2 shows that the majority of newborns had normal birth weight (70.0%), while 24.0% were classified as low birth weight and 6.0% as macrosomic infants.

**Table 3.** Distribution of Newborns Based on Gestational Age

| Gestational Age Category | Frequency (n) | Percentage (%) |
|---|---|---|
| Preterm (<37 weeks) | 10 | 20.0 |
| Term (37–41 weeks) | 37 | 74.0 |
| Post-term (≥42 weeks) | 3 | 6.0 |
| Total | 50 | 100.0 |

As presented in Table 3, most newborns were delivered at term gestation (74.0%), followed by preterm births (20.0%) and post-term births (6.0%).

**Table 4.** Distribution of Fifth-Minute APGAR Scores

| APGAR Score Category | **Frequency (n)** | **Percentage (%)** |
|---|---|---|
| Low (0–3) | 2 | 4.0 |
| Moderate (4–6) | 10 | 20.0 |
| Normal (7–10) | 38 | 76.0 |
| Total | **50** | **100.0** |

Table 4 indicates that most newborns achieved a normal fifth-minute APGAR score (76.0%), while 20.0% had moderate scores and 4.0% had low scores.

**Table 5.** Distribution of Fifth-Minute APGAR Scores by Birth Weight

| Birth Weight | **Low (0–3)** | **Moderate (4–6)** | **Normal (7–10)** | **Total** |
|---|---|---|---|---|
| LBW (<2500 g) | 2 | 6 | 4 | 12 |
| Normal (2500–3999 g) | 0 | 4 | 31 | 35 |
| Macrosomia (≥4000 g) | 0 | 0 | 3 | 3 |
| Total | **2** | **10** | **38** | **50** |

The distribution demonstrates that newborns with low birth weight were more likely to have lower APGAR scores compared to infants with normal birth weight or macrosomia. Most newborns with normal birth weight achieved normal fifth-minute APGAR scores.

**Table 6. Distribution of Fifth-Minute APGAR Scores by Gestational Age**

| Gestational Age | Low (0–3) | Moderate (4–6) | Normal (7–10) | Total |
|---|---|---|---|---|
| Preterm (<37 weeks) | 2 | 5 | 3 | 10 |
| Term (37–41 weeks) | 0 | 5 | 32 | 37 |
| Post-term (≥42 weeks) | 0 | 0 | 3 | 3 |
| Total | 2 | 10 | 38 | 50 |

Table 6 shows that preterm newborns had a higher proportion of low and moderate APGAR scores than term and post-term infants. In contrast, most term newborns achieved normal fifth-minute APGAR scores.

Among the 50 newborns included in this study, the majority had normal birth weight (70.0%), term gestational age (74.0%), and normal fifth-minute APGAR scores (76.0%). Lower APGAR scores were observed more frequently among low birth weight and preterm infants, whereas normal APGAR scores predominated among newborns with normal birth weight and term gestation. These findings suggest that birth weight and gestational age may influence neonatal adaptation during the early postnatal period.

## 4. Discussion

The findings of this study indicate that the majority of newborns had normal birth weight, term gestational age, and fifth-minute APGAR scores within the normal range. Nevertheless, lower APGAR scores were more frequently observed among infants with low birth weight and preterm birth, suggesting that neonatal adaptation during the early minutes of life varies according to fetal maturity and birth weight status (Abukari et al., 2020;Elhag et al., 2025).

In this study, newborns with normal birth weight predominantly achieved fifth-minute APGAR scores within the normal range (7–10). This finding is consistent with previous evidence suggesting that adequate birth weight reflects better fetal growth and physiological readiness for extrauterine life. Infants born with low birth weight generally

possess limited energy reserves and immature organ function, particularly within the respiratory and cardiovascular systems, which may impair their ability to adapt immediately after birth. Several studies have identified low birth weight as a significant factor associated with lower fifth-minute APGAR scores and increased neonatal morbidity(Reza Baneshi et al., 2011).

These findings support the interpretation that adequate birth weight reflects better fetal growth and more optimal physiological readiness for the transition to extrauterine life. Conversely, prematurity is associated with a higher frequency of low APGAR scores, particularly among infants with more severe degrees of prematurity. Therefore, the fifth-minute APGAR score not only represents the newborn's immediate condition after birth but may also reflect the degree of biological immaturity and the neonate's capacity for postnatal adaptation (Cnattingius et al., 2020; Abukari et al., 2020).

The present study also demonstrated that preterm infants exhibited a higher proportion of low and moderate APGAR scores compared with term infants. Prematurity is closely associated with incomplete maturation of the lungs, central nervous system, and cardiovascular system. Consequently, preterm newborns are more vulnerable to respiratory distress, poor muscle tone, and inadequate physiological adaptation after delivery, which can contribute to lower APGAR scores. Previous studies have reported that preterm birth significantly increases the likelihood of low fifth-minute APGAR scores and adverse neonatal outcomes(Abebe et al., 2024).

The majority of term infants in this study achieved fifth-minute APGAR scores within the normal range. This finding is consistent with previous evidence indicating that an APGAR score of 7–10 is classified as normal and reflects a reassuring neonatal condition during the immediate postnatal period. Conversely, lower fifth-minute APGAR scores among term infants have been associated with an increased risk of neonatal morbidity and mortality (Elhag et al., 2025; Hong et al., 2024).

The predominance of normal APGAR scores among term infants may be explained by the fact that, at this gestational age, physiological adaptation to extrauterine life generally proceeds more effectively compared with less mature infants. Even within the term category, the risk of adverse outcomes decreases with advancing gestational age, while early-term infants continue to demonstrate a higher risk of severe neonatal morbidity compared with full-term infants. These findings highlight that gestational maturity remains an important determinant of early neonatal adaptation

The relationship between birth weight, gestational age, and APGAR scores observed in this study is also consistent with recent literature demonstrating that neonatal outcomes are strongly influenced by fetal maturity and growth status. Among late preterm infants, short-term complications decrease with increasing gestational age, whereas in a Sudanese cohort, low birth weight was identified as the strongest factor associated with a low fifth-minute APGAR score (Mekić et al., 2023; Elhag et al., 2025).

The combination of low birth weight, prematurity, and low APGAR scores is associated with poorer neonatal prognosis compared with the interpretation of these indicators individually. In extremely preterm infants, each 100-gram increase in birth weight was associated with a 41% reduction in the odds of mortality, while each one-point increase in the fifth-minute APGAR score was associated with a 75% reduction in

the odds of death. These findings indicate that the prognostic value of the APGAR score becomes more informative when interpreted in conjunction with birth weight and gestational age (Khandelwal & Datta, 2025;Zakerihamidi et al., 2023).

Although the majority of newborns in this study achieved normal APGAR scores, the presence of moderate and low scores among low birth weight and preterm infants highlights the importance of careful neonatal assessment immediately after delivery. Early identification of newborns at risk enables healthcare providers to provide timely monitoring and intervention, thereby reducing the likelihood of adverse neonatal outcomes.

A limitation of this study is its descriptive design, which does not permit conclusions regarding causal relationships between birth weight, gestational age, and APGAR scores. In addition, the study relied on medical record data, which may be affected by variations in documentation practices. Future studies employing analytical designs and larger sample sizes are recommended to further explore the influence of perinatal factors on neonatal adaptation and APGAR outcomes.

## 5. Conclusion

This study demonstrated that fifth-minute APGAR scores differed across birth weight and gestational age categories. Lower APGAR scores were more frequently observed among low birth weight and preterm newborns, whereas normal APGAR scores predominated among infants with normal birth weight and term gestation. These findings support the importance of routine assessment of birth weight, gestational age, and fifth-minute APGAR score to facilitate the early identification and appropriate monitoring of newborns requiring closer neonatal observation.

## 6. Acknowledgment

This study demonstrated that fifth-minute APGAR scores differed across birth weight and gestational age categories. Lower APGAR scores were more frequently observed among low birth weight and preterm newborns, whereas normal APGAR scores predominated among infants with normal birth weight and term gestation. These findings support the importance of routine assessment of birth weight, gestational age, and fifth-minute APGAR score to facilitate the early identification and appropriate monitoring of newborns requiring closer neonatal observation.

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