



(RESEARCH ARTICLE)



## Apgar score comprehension in clinical practice: A cross-sectional study of healthcare professionals in Dhaka, Bangladesh

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### Abstract

**Introduction:** The Apgar score is a critical tool for assessing the health of newborns immediately after birth, with implications for immediate clinical care decisions. Despite its established importance, variations in the comprehension and application of the Apgar score among healthcare professionals can significantly affect neonatal outcomes.

**Objective:** This cross-sectional study aimed to assess the comprehension and application of the Apgar score among healthcare professionals in Dhaka, Bangladesh, to identify gaps in knowledge and practice that could impact neonatal care outcomes.

**Methods:** Conducted between September and December 2022 at a tertiary medical college and hospital in Dhaka, this study involved 80 nurses from the labor room, selected through purposive sampling. Data were collected via face-to-face interviews using a pre-tested semi-structured questionnaire, with knowledge assessed on a 24-point scale and categorized as good (>15) or poor (≤15). Statistical analysis was performed using SPSS 26.0.

**Results:** Most respondents (31.78% aged 27-33 years and 32.63% aged 34-39 years) were nursing college graduates (40.69%). A significant knowledge gap was identified, with only 25.33% demonstrating a good level of understanding of the APGAR score. Notable discrepancies were found in the recognition of the Apgar score's components, criteria, and clinical implications. Educational level significantly influenced Apgar score knowledge ( $p=0.046$ ), with nursing college graduates showing greater understanding. Recent training appeared to impact knowledge positively, suggesting the need for continuous professional development.

**Conclusion:** The study highlights a concerning gap in the understanding and application of the Apgar score among healthcare professionals in Dhaka, emphasizing the need for enhanced neonatal care education and training. Addressing these gaps through comprehensive educational programs and continuous professional development is crucial for improving neonatal assessment practices and outcomes in Bangladesh.

**Keywords:** Apgar score; Neonatal care; Healthcare professionals; Education; Bangladesh

### 1. Introduction

In the crucial hours after delivery, the Apgar score serves as an essential tool for rapidly assessing a newborn's health status. Devised by Dr. Virginia Apgar in 1952, this scoring system evaluates infants on five critical criteria: Appearance, Pulse, Grimace, Activity, and Respiration, each scored from 0 to 2, with a maximum total score of 10. This initial

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assessment, conducted at one and five minutes post-delivery, is vital for identifying newborns requiring immediate medical attention (AAPCFN, 2015). Despite its widespread acceptance and utilization globally, the interpretation and application of the Apgar score by healthcare professionals exhibit significant variability, potentially impacting neonatal outcomes (Tarimo et al., 2022). This variability underscores a crucial gap in neonatal care, particularly in settings with limited resources or where continuous medical education might be intermittent (Corman et al., 2018). In Bangladesh, a country marked by its dynamic yet resource-constrained healthcare landscape, neonatal mortality remains a pressing concern, accounting for a substantial proportion of under-5 deaths (Rosa-Mangeret et al., 2022). The country has made commendable progress in healthcare; however, challenges persist, especially in the nuanced competencies required in neonatal care, including the effective use of the Apgar scoring system (Lone and Van Hal, 2022). Recent studies highlight a critical gap in the understanding and application of the Apgar score among healthcare providers in various global contexts, leading to disparities in neonatal care (Chang et al., 2018; Wastnedge et al., 2021). In Dhaka, the capital of Bangladesh, where healthcare services are concentrated but overwhelmed by demand, the proficiency in Apgar score usage among healthcare professionals remains underexplored (Davis-Floyd & Sargent, 2023). The present study aims to bridge this knowledge gap by assessing the comprehension and application of the Apgar score among healthcare professionals in Dhaka, Bangladesh. This investigation is pivotal for several reasons. Firstly, it interprets the current state of neonatal assessment competencies among professionals in a critical care setting. Secondly, it identifies potential areas for improvement in medical education and training concerning neonatal care. Lastly, it contributes to the global discourse on standardizing Apgar score interpretation and application, ensuring that newborns receive the most appropriate care based on a universally understood and applied assessment tool (Reddy et al., 2017). Given the comprehensive nature of this study, it not only enhances the understanding of Apgar score comprehension among healthcare professionals in Dhaka but also provides a template for similar assessments in other regions, ultimately aiming to standardize neonatal care practices globally (Sharrow et al., 2022).

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## 2. Material and method

A descriptive cross-sectional study was conducted at a tertiary medical college and hospital in Dhaka, Bangladesh, focusing on the nurses working in the labor room, between September 2022 and December 2022. Utilizing a purposive sampling method, the sample size was determined using the formula  $n = z^2pq/d^2$ , with  $z$  representing the standard normal deviate (1.96 for a 95% confidence interval), and  $d$  the confidence level (0.05), resulting in a sample size of 80. Inclusion criteria were nurses in the labor room willing to participate, excluding those overly occupied during data collection. Data collection was conducted through face-to-face interviews using a pre-tested, semi-structured questionnaire encompassing socio-demographic and nursing practice-related questions. For quality control, the data were regularly reviewed with guidance from the supervising faculty. Data management involved using SPSS 26.0 for entry and analysis, with results presented in tables and charts. Knowledge was assessed by scoring participants' answers to specific questions, with correct responses earning one point, and the total possible score ranging from zero to twenty-four. The knowledge level was categorized as good ( $>15$ ) and poor ( $\leq 15$ ). Ethical approvals were taken from the Research Ethics Committee of the Faculty of Allied Health Sciences, Daffodil International University. Informed consent was taken from every participant, and strict confidentiality and anonymity were maintained at every stage of the research.

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## 3. Results

The socio-demographic characteristics of the respondents ( $n=80$ ) were diverse, encompassing a range of age groups, educational backgrounds, marital statuses, places of residence, years of experience in the delivery room, and sources of information. The age distribution indicated that most respondents fell within the 27 to 39 years age range, with 31.78% being 27 to 33 years, 32.63% being 34 to 39 years, and an overall mean age of 35.87 years ( $SD = 8.71$ ). In terms of educational attainment, the largest proportion of respondents were nursing college graduates (40.69%), followed by institute graduates (32.52%), and midwifery school attendees (26.79%). The marital status revealed that a significant majority were married (76.28%), with smaller percentages being single (22.04%) and divorced (1.68%). The respondents predominantly resided in urban areas (61.21%) compared to rural regions (38.79%). The years of experience in the delivery room varied, with 29.84% having 16 years or more of experience, and the least experienced group ( $<1$  year) accounting for 7.28%. Regarding sources of information, academy study was the most cited (37.90%), followed by the Internet (21.19%), workshops (18.73%), medical magazines and books (14.28%), and video & films (7.90%) (Table 1).

**Table 1** Socio-demographic characteristics of the respondents (n=80)

Socio-demographic variables	No. of respondents	Percentage (%)
<b>Age group</b>		
21 to 26 years	10	12.67
27 to 33 years	25	31.78
34 to 39 years	26	32.63
40 and more	18	22.92
Mean $\pm$ SD	35.87 $\pm$ 8.71	
<b>Level of education</b>		
Midwifery school	21	26.79
Institute graduate	26	32.52
Nursing college graduate	33	40.69
<b>Marital status</b>		
Marital status		
Single	18	22.04
Married	61	76.28
Divorced	1	1.68
<b>Residence</b>		
Rural	31	38.79
Urban	49	61.21
<b>Years of experience in the delivery room</b>		
<1 year	6	7.28
1 to 5 years	14	17.42
6 to 10 years	22	27.19
11 to 15 years	15	18.27
16 years and more	24	29.84
<b>Source of information</b>		
Medical magazines & Books	11	14.28
Workshops	15	18.73
Academy study	30	37.90
Video & Films	6	7.90
Internet	17	21.19

The distribution of respondents' knowledge regarding the Apgar score reveals critical insights into the familiarity and comprehension of this essential neonatal assessment tool within a healthcare setting. The Apgar score, developed to evaluate a newborn's condition at 1-, 5-, and 10-minutes post-birth, incorporates five key signs, each scored between 0 to 2, with a maximum cumulative score of 10 indicating optimal neonatal health. The findings show a varied understanding among respondents: only 14.83% correctly identified the Apgar score as an objective quantification method used at specified intervals after birth, with a substantial proportion either negating its usage (28.79%) or expressing uncertainty (56.38%).

Further assessment reveals that 24.49% of respondents recognize the significance of the Apgar score in interpreting a newborn's clinical status and response to resuscitation, yet a notable percentage remains unsure (48.53%). When it comes to the specifics of the scoring system, only 17.83% accurately acknowledge that the Apgar score entails assessing five distinct signs, with a larger segment either unaware (37.27%) or undecided (44.90%). This pattern extends to the understanding of individual scoring criteria (0 for very weak, 1 for mild to moderate, and 2 for good condition), where discrepancies and uncertainties continue to surface among the participants.

Delving into the particulars of each Apgar component—respirations, heart rate, muscle tone, reflex response, and skin color—further underscores the inconsistencies in knowledge. For instance, while 41.96% correctly associate a strong cry with a score of 2 under respirations, the clarity diminishes with components like a reflex response, where only 18.36% associate a vigorous cry or withdrawal with a score of 2, and a significant portion remains uncertain across most categories. Knowledge level was categorized as

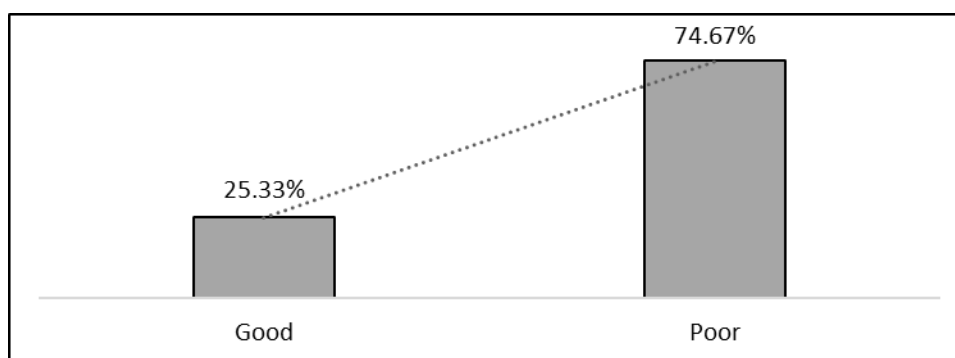
Critically, the understanding of the aggregated Apgar score's implications for neonatal care—especially in diagnosing the severity of birth asphyxia and determining the necessity for resuscitation measures—shows a similar trend of partial comprehension and notable indecision. For example, 28.60% correctly identify a score of 0-3 as indicative of severe birth asphyxia requiring immediate intervention, yet a considerable fraction either disagrees (33.81%) or is unsure (37.59%) (Table 2).

**Table 2** Distribution of the respondents according to their knowledge of Apgar score (n=80)

Question/statement	Answer options					
	Yes		No		Not sure	
	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.
Apgar score is an objective method of quantifying the newborn's condition is used at 1, 5, and 10 minutes after birth	12	14.83	23	28.79	45	56.38
An Apgar score is a significant tool for the interpretation of a newborn's clinical status and response to resuscitation	20	24.49	22	26.98	39	48.53
Apgar score including five signs must be the measurement & evaluation, the score 0, 1, or 2.	14	17.83	30	37.27	36	44.90
Measure 0 (Very weak)	16	19.61	27	33.24	38	47.15
Measure 1 (Mild to moderate)	20	24.62	39	48.47	22	26.91
Measure 2 (Good condition)	19	23.66	34	42.08	27	34.26
<b>The five signs or categories must be checked</b>						
<b>Respirations</b>						
Not breathing = 0	19	23.89	30	37.84	31	38.27
Weak cry, irregular breathing = 1	24	29.68	26	31.90	31	38.42
Strong cry = 2	34	41.96	18	22.71	28	35.33
<b>Heart rate</b>						
Absent heartbeat = 0	20	25.00	31	38.57	29	36.43
Show heartbeat (less than 100 beats per minute) = 1	27	33.43	20	24.86	33	41.71
Adequate heartbeat (more than 100 beats per minute) = 2	10	12.11	39	48.89	31	39.00
<b>Muscle tone</b>						
Limp = 0	17	21.80	21	26.47	41	51.73
Some flexing or bending = 1	15	18.67	25	31.78	40	49.55
Active body movements = 2	23	28.74	30	37.54	27	33.72

<b>Reflex response</b>						
No response = 0	14	16.91	39	48.64	28	34.45
Grimace = 1	7	8.79	43	53.80	30	37.41
Vigorous cry or withdrawal = 2	15	18.36	38	47.53	27	34.11
<b>Skin color</b>						
Pale or blue = 0	27	33.17	17	21.29	36	45.54
Normal color body but blue extremities= 1	26	32.68	22	27.55	32	39.77
Normal color = 2	37	46.71	19	23.89	24	29.40
<b>The nurse integrates and sums the best possible score totaling 10</b>						
0-3 Severe Birth Asphyxia requiring resuscitation steps	23	28.60	27	33.81	30	37.59
4-6 Mild to Moderate Asphyxia warranting simple resuscitation measurement	24	29.57	31	38.52	26	31.91
7+ Normal no need for resuscitation	26	32.76	24	29.60	30	37.64

Figure 1 illustrates the distribution of 80 respondents' knowledge levels regarding the Apgar score, a fundamental neonatal assessment tool used to evaluate a newborn's health status immediately after birth. The analysis categorizes respondents' understanding into 'Good' and 'Poor', based on their proficiency and accuracy in interpreting the Apgar scoring system. The findings reveal a significant disparity in knowledge: only 25.33% of the surveyed healthcare professionals demonstrated a 'Good' level of understanding, characterized by accurate knowledge of the Apgar score's components, criteria, and clinical implications. In stark contrast, a substantial majority of 74.67% were classified under 'Poor' knowledge, indicating a lack of comprehensive understanding or significant misconceptions regarding the Apgar score, its application, and interpretation.



**Figure 1** Distribution of the respondents according to their level of knowledge on Apgar score based on scoring (n=80)

Table 03 explores the correlation between the socio-demographic characteristics of the respondents (n=80) and their level of knowledge on Apgar scores, classified into 'Good' and 'Poor'. Age-wise, the data presents a nuanced view with the '21 to 26 years' age group showing a higher percentage (19.73%) of respondents with 'Good' knowledge compared to the '40 and more' age group, which had only 16.36%. However, the p-value of 0.061 suggests that the association between age groups and Apgar score knowledge is not statistically significant, indicating that age alone may not be a determinant factor in the understanding of the Apgar scoring system. Educational attainment emerges as a significant factor, with 'Nursing college graduates' displaying a markedly higher proportion (36.86%) of 'Good' knowledge relative to 'Midwifery school' attendees (9.33%), supported by a p-value of 0.046, highlighting a statistically significant correlation. This suggests that advanced educational levels may enhance understanding of neonatal assessment protocols like the Apgar score. Marital status and place of residence showed varied knowledge levels but were not statistically significant, with p-values of 0.075 and 0.071, respectively. This indicates that these socio-demographic factors do not markedly influence the level of Apgar score knowledge among respondents. Interestingly, years of experience in the delivery room presented a more complex picture. Respondents with 'Less than 1 year' of experience had a higher proportion (34.34%) of 'Good' knowledge compared to those with '6 to 10 years' of experience (18.39%),

with a p-value of 0.033, suggesting a statistically significant association. This may imply that recent training or education has a more immediate impact on the understanding of Apgar scores, which could diminish over time without ongoing professional development.

**Table 3** Association of respondents' level of knowledge on Apgar scores with their socio-demographic characteristics

Socio-demographic variables	No. of respondents		Level of knowledge				P value
			Good (20)		Poor (60)		
	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	
<b>Age group</b>							
21 to 26 years	10	12.67	2	19.73	8	80.27	0.061
27 to 33 years	25	31.78	7	27.53	18	72.47	
34 to 39 years	26	32.63	8	30.65	18	69.35	
40 and more	18	22.92	3	16.36	15	83.64	
<b>Level of education</b>							
Midwifery school	21	26.79	2	9.33	19	90.67	0.046
Institute graduate	26	32.52	6	23.06	20	76.94	
Nursing college graduate	33	40.69	12	36.86	21	63.14	
<b>Marital status</b>							
Single	18	22.04	5	28.36	13	71.64	0.075
Married	61	76.28	15	24.58	46	75.42	
Divorced	1	1.68	0	0.00	1	100.00	
<b>Residence</b>							
Rural	31	38.79	8	25.78	23	74.22	0.071
Urban	49	61.21	12	24.51	37	75.49	
<b>Years of experience in the delivery room</b>							
<1 year	6	7.28	2	34.34	4	65.66	0.033
1 to 5 years	14	17.42	3	21.53	11	78.47	
6 to 10 years	22	27.19	4	18.39	18	81.61	
11 to 15 years	15	18.27	4	27.37	11	72.63	
16 years and more	24	29.84	7	29.32	17	70.68	

#### 4. Discussion

The results of this cross-sectional study conducted among healthcare professionals in Dhaka, Bangladesh, offer insightful revelations into the comprehension and application of the Apgar score, a fundamental neonatal assessment tool. This study identified a notable variance in the understanding of the Apgar score, with only a quarter of respondents demonstrating a 'Good' level of knowledge. This gap is particularly concerning given the critical role of the Apgar score in immediate neonatal care and decision-making processes. Similar disparities have been reported in studies from diverse geographic locales, underscoring a global inconsistency in neonatal assessment competencies. For instance, a study conducted in a tertiary hospital in Nigeria reported that nearly one-third of the healthcare staff could accurately describe the Apgar scoring system (Ige et al., 2015), resonating with our findings of limited comprehension among healthcare providers. Furthermore, this study revealed that educational attainment significantly influenced the level of understanding of the Apgar score, with nursing college graduates displaying superior knowledge compared to their counterparts from midwifery schools and institutes. This correlation between higher education levels and better

comprehension has been mirrored in the literature, highlighting the imperative for robust and standardized educational curricula across healthcare disciplines (Akbar et al., 2021). Remarkably, years of experience in the delivery room had a complex relationship with Apgar score knowledge. This study's findings suggest that recent graduates or those with less experience were more likely to exhibit a 'Good' understanding, possibly reflecting more recent or updated training. This observation is congruent with a study by Nadler et al. (2010), which suggested that continuous professional development and refresher courses significantly enhance clinical competencies, including neonatal assessment skills. The reliance on diverse sources of information, with academy study being the most prevalent, followed by the internet and workshops, underscores the multifaceted nature of learning and the potential for leveraging digital platforms to augment traditional education. This aligns with the growing body of research advocating for digital and blended learning approaches to enhance healthcare education and competencies (Paige et al., 2020; Greenwood et al., 2018). The implications of this study extend beyond the immediate clinical setting, highlighting the urgent need for systemic interventions to bolster the comprehension and application of the Apgar score among healthcare professionals. This entails not only curricular enhancements but also the integration of continuous professional development programs that address the evolving needs of neonatal care.

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## 5. Conclusion

This study among healthcare professionals in Dhaka, Bangladesh, has illustrated the gaps in understanding and applying the Apgar score, a crucial neonatal assessment tool. Despite its critical importance, a significant portion of the respondents lacked comprehensive knowledge of the Apgar score, underlining an urgent need for enhanced education and continuous professional development in neonatal care. Educational level was a key determinant of Apgar score knowledge, suggesting that an enriched curriculum and refresher courses could substantially improve neonatal care competencies. The study also points to the potential of leveraging diverse and digital learning resources to strengthen healthcare education. To advance neonatal care quality and outcomes, healthcare institutions should incorporate comprehensive, standardized training in neonatal assessment within their educational frameworks and support ongoing learning for healthcare professionals. Addressing these educational gaps is essential for standardizing neonatal assessments and enhancing care for newborns, ultimately contributing to the reduction of neonatal mortality rates. In essence, the effectiveness of the Apgar score in neonatal care is heavily reliant on the depth of healthcare professionals' knowledge and consistent application of this assessment tool. Through focused educational efforts and continuous professional development, we can ensure that all newborns receive the highest standard of care from the inception.

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## Compliance with ethical standards

### *Acknowledgment*

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### *Disclosure of conflict of interest*

Regarding this work, the authors declared that they have no conflicting interests.

### *Statement of ethical approval*

The present research work does not contain any studies performed on animal/human subjects by any of the authors.

### *Consent for publication*

The consent to publish this paper has been granted by each author.

### *Statement of informed consent*

Every individual participant participating in the study gave informed consent.

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