

Comparison of Conventional and Combined APGAR score in Predicting Adverse Early Neurologic Outcomes in Term and Near Term Babies with Birth Asphyxia.

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ABSTRACT

Background: Objective: To compare the Conventional and Combined Apgar scoring systems in predicting adverse early neurologic outcomes in term and near term babies with birth asphyxia. **Methods:** A retrospective cross sectional study was conducted over a period of 2 years. All the neonates with gestational age more than 35 weeks delivered in this hospital with birth asphyxia requiring admission in NICU were included in the study. Neonates with gestational age less than 35 weeks, those with major congenital anomalies and death in delivery room were excluded from the study. The APGAR and COMBINED APGAR scores were noted. Convulsion, use of anticonvulsant drugs, requirement of mechanical ventilation, and duration of hospital stay were also noted. The data was analysed using fisher exact test. **Results:** Statistically significant associations were observed between Apgar score less than 3 at 1 minute and occurrence of convulsion ($p=0.003$) and requirement of ventilation ($p<0.001$), Apgar score less than 6 at 5 minutes" occurrence of convulsion ($p=0.001$) and requirement of ventilation ($p<0.001$), Combined Apgar score less than 7 at 1 minute and occurrence of convulsion ($p=0.003$) and requirement of ventilation ($p=0.002$), Combined Apgar score less than 10 at 5 minutes and occurrence of convulsion ($p<0.001$) and requirement of ventilation ($p<0.001$), and early neonatal death (within 7 days)" and Combined Apgar score less than 7 at 1 minute ($p=0.09$) and Combined Apgar score less than 10 at 5 minutes ($p=0.09$). **Conclusion:** Though a low combined apgar score was superior to the traditional apgar score in predicting early neonatal mortality, no difference was seen in prognostication of convulsion and mechanical ventilation.

Keywords: Apgar, Combined Apgar, Birth Asphyxia, Convulsion, Mechanical Ventilation.

INTRODUCTION

A gold standard definition of birth asphyxia does not exist. It is probably better to use the term perinatal asphyxia since asphyxia may occur in utero, at birth or in the postnatal period. WHO has defined perinatal asphyxia as a "failure to initiate and sustain breathing at birth".^[1]

Birth asphyxia refers to a condition of impaired gas exchange that leads, if persistent, to fetal hypoxemia and hypercarbia. It occurs during the first and second stage of labor and is identified by fetal acidosis, as measured in umbilical arterial blood. The umbilical artery pH that defines asphyxia of a sufficient degree to cause brain injury is unknown but serious central nervous system, respiratory, cardiovascular, and renal complications can occur if the imbalance is persistent.^[2-5]

Early newborn assessment, prediction of the neonatal complications, and prompt intervention is

crucial, to prevent the progression of asphyxia and also not to lose the window of therapeutic opportunity for minimizing its complications.^[6]

Apgar scoring system which was described in 1950s is the oldest and most commonly used assessment tools for the evaluation of the newborn and the need for interventions in the delivery room.^[7-9]

Although Apgar score does not exactly predict the neurodevelopmental outcome the 5 minute Apgar score is still the most practical, feasible and valid index for assessing the effectiveness of resuscitation and vitality of newborn.^[10]

There are several limitations with the Apgar score that make it inappropriate to be used alone for establishing the diagnosis of asphyxia, or for predicting the adverse neonatal outcomes. Apgar score is influenced by the gestational age, neonate's maturity, drugs, etc. In addition the Apgar score that is assigned during resuscitation and intubation does not give a precise assessment of the newborn's situation.^[11,12] Inter-observer variability is also an important limitation.^[13]

Certain studies show that it is not appropriate to label preterm newborn infants as asphyxiated based on low Apgar score.^[14,15]

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These limitations made the researchers think of an alternative to the conventional Apgar score. There was still a need for a more comprehensive and precise scoring system that could predict the occurrence of adverse neonatal outcomes. Thus the Combined-Apgar score was proposed by Rüdiger et al. that consists of both the Specified and the Expanded Apgar scores to allow a more detailed description of neonate's postnatal condition. CPAP, Oxygen, Bag and mask ventilation, Intubation and ventilation, chest compression, exogenous drug administration and surfactant administration are included in the scoring process [Table 1].^[16-18]

However, after a thorough search of existing literature showed that the studies demonstrating the use of combined Apgar score are scarce, especially in India.

We therefore conducted this study to compare the Apgar scoring systems (traditional and combined) in predicting adverse early neurologic outcomes in the neonates especially after asphyxia and the hemodynamic instability of the near term and term newborns.

Table 1: The Combined-Apgar scoring system

		Minutes		
		1	5	10
C	Continuous Positive Airway Pressure (a)			
O	Oxygen			
M-B	Mask and Bag Ventilation (b)			
I	Intubation and Ventilation			
N	Neonatal Chest Compression			
E	Exogenous Surfactant			
D	Drugs			
	Sum of Expanded Apgar			
	Scoring Each Item:			
	0 = Intervention was performed; 1 = No intervention was performed			
	(a): score 0 if "Mask and Bag" or "Intubation and Ventilation" is score 0			
	(b): score 0 if "Intubation and Ventilation" is scored 0			
A	Appearance (Skin Color)			
	2 = Completely pink			
	1 = Centrally pink with acrocyanosis			
	0 = Centrally blue or pale			
P	Pulse (HR)			
	2 = > 100 beats per minute			
	1 = < 100 beats per minute			
	0 = No heart beat			
G	Grimacing (Reflex)			
	1 = Reduced for gestational age			
	2 = Appropriate for gestational age			
	0 = No reflex response			
A	Activity (Muscle Tone)			
	2 = Appropriate for gestational age			
	1 = Reduced for gestational age			
	0 = No reflex response			
R	Respiration (Chest Movement)			
	2 = Regular chest movement			
	1 = Small of irregular chest movement			
	0 = No chest movement			
	Sum of Specified Apgar			
	Total (Sum of Expanded + Specified)			

MATERIALS AND METHODS

A retrospective cross sectional study was conducted over a period of 2 years. All the neonates with gestational age more than 35 weeks delivered in this hospital with birth asphyxia requiring admission in NICU were included in the study. Neonates with gestational age less than 35 weeks, those with major congenital anomalies and death in delivery room were excluded from the study. The APGAR and COMBINED APGAR scores were noted. Convulsion, use of anticonvulsant drugs, requirement of mechanical ventilation and duration of hospital stay were also noted. The data was analysed using fisher exact test.

RESULTS

A total of 84 newborns were admitted to nicu with birth asphyxia in our study. Out of the total study population, 52% were term and 48% were late preterm. In the study population, 20 newborns (24%) had normal vaginal delivery, 38 newborns (45%) had an emergency caesarian section and 26 newborns (31%) were delivered by elective caesarian section.

A statistically significant association was seen between Apgar score less than 3 at 1 minute and less than 6 at 5 minutes and occurrence of convulsion ($p=0.003$ at 1 min and $p=0.001$ at 5 min) and requirement of ventilation ($p<0.001$ at 1 min and $p<0.001$ at 5 min).

Similar association was observed between Combined Apgar score less than 7 at 1 minute and less than 10 at 5 minutes and occurrence of convulsion ($p=0.003$ at 1 min and $p<0.001$ at 5min) and requirement of ventilation ($p=0.002$ at 1 min and $p<0.001$ at 5 min).

Further, significant association was noticed between early neonatal death (within 7 days) and Combined Apgar score less than 7 at 1 minute ($p=0.09$) and Combined Apgar score less than 10 at 5 minutes ($p=0.09$) but p values were not significant in conventional Apgar score.

DISCUSSION

In this study we found a statistically significant relation between both low Apgar and Combined Apgar score and occurrence of convulsion and requirement of ventilation. However, there was no statistically significant difference between conventional Apgar and Combined Apgar score in predicting the early adverse neonatal outcome in neonates with birth asphyxia but early neonatal deaths were better predicted by combined Apgar score.

In a study by Hardani et al, it was seen that better assessment of condition after birth in asphyxiated

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newborns by combined Apgar score when compared to conventional Apgar score.^[19] Similar conclusions were found in other studies.^[16-18] However all the above studies had included both preterm and term neonates in the study population.

Premature newborns often require active interventions in the perinatal period which include bag and mask ventilation and use of exogenous drugs like oxygen and adrenaline. Use of surfactant and consequent mechanical ventilation are not uncommon.^[20] All of these interventions are included in the scoring system for combined Apgar score. Since our study population included near term and term babies, the requirement of the aforementioned interventions was less.

All the deaths in our study had been delivered by emergency caesarian sections. This was probably because the hypoxia had its onset in utero in the above cases which compromised the fetal well being and required emergency caesarian section. The hypoxic ischemic damage was antenatal in onset.

As the study included only term and near term babies and the components like use of bag and mask, intubation, drugs and surfactant is minimal in comparison to preterm babies. Hence, the confounding factor of prematurity which could affect a poor Apgar score was eliminated. So both scores were compared in only term babies as a set of study population as both the scores do not have gestational age as a component for scoring.

CONCLUSION

A low combined Apgar score was superior to the traditional Apgar score in predicting early neonatal mortality (within 7 days of life) but no statistical difference was seen in prognostication of convulsion and mechanical ventilation.

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