



## Research Article

# Comparison of APGAR Scores of Newborns with Mode of Delivery and Its Associated Factors

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### Article Information

Received: 20 June 2020  
Revised version received: 10 July 2020  
Accepted: 13 July 2020  
Published: 27 July 2020

#### Cite this article as:

L. Paudyal (2020) *Int. J. Soc. Sc. Manage.* 7(3): 176-182. DOI: [10.3126/ijssm.v7i3.29961](https://doi.org/10.3126/ijssm.v7i3.29961)

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Peer reviewed under authority of IJSSM  
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**Keywords:** APGAR; Cesarean delivery; Vaginal delivery; Newborn

### Abstract

Newborn baby should be assessed immediately soon after the birth and the APGAR (Appearance, Pulse, Grimace, Activity, Respiration) score is the most commonly used, simple and most effective method of immediate newborn assessment. The aim of the study was to compare the newborn APGAR score on first and fifth minute in two different mode of delivery; Normal Vaginal delivery (NVD) and Cesarean Delivery (CD) and its contributing factors. A cross-sectional study design with comparative research approach was adopted to conduct the research. Total 200 singleton babies (100 NVD and 100 CD) were selected and APGAR score was checked in the first and fifth minutes from baby's birth record. Data were analyzed using descriptive and inferential statistics. Results showed that 88 and 95 percentage of neonatal APGAR scores in 1<sup>st</sup> and 5<sup>th</sup> minutes were more than seven, respectively. There were no significant statistical differences between APGAR score of 1<sup>st</sup> and 5<sup>th</sup> minutes in two methods of delivery ( $t=0.067$  and  $0.066$  on 1<sup>st</sup> minute and 5<sup>th</sup> minute respectively,  $p>0.05$ ). However, premature newborns, low birth weight, mother's age and weight of mother, no of parity has effect on APGAR score. The study findings concluded that not the method of delivery has any effect on the low Apgar score of babies on birth but the factors such as prematurity, maternal age, mother's weight, no of parity, low birth weight has significant association on low APGAR score of babies.

### Introduction

For a newborn baby to enter into a new world outside of the uterus can be challenging as they have to adopt significant physiological changes after delivery. Newborns can be delivered through normal vaginal delivery, assisted vaginal delivery and cesarean section. The method of delivery is very important for both maternal and neonatal outcome of health, thus to choose the healthiest delivery method for mother and also with no adverse effects on neonates should

be considered (Bakhsha *et al.*, 2016). According to the World Health Organization [WHO], (2019), 2.5 million neonates died in 2018, accounting for a staggering 7,000 newborn deaths daily, amounting to 47% of all child death under 5 years of age. The majority 75% of neonatal death occurs during 1<sup>st</sup> week of life and about 1 million dying on the first day of life. In Nepal, Neonatal Mortality rate is 21 deaths per 1000 live births according to Nepal Demographic

and Health Survey [NDHS], (2016). Therefore, it is of paramount importance to assess the health status of the neonate during the birth procedure using validated methods such as the APGAR scoring system. The APGAR score is the most commonly used simple and effective method of measuring newborn's wellbeing immediately after the birth (Casey *et al.*, 2001). It is comprehensive screening system with simple and reliable criterion to evaluate the newborns condition at birth, which has been developed by Virginia Apgar, a physician anesthesiologist in 1952. The average score depends on five physiological criteria which includes heart rate, skin color, respiratory condition, muscle rigidity and neonatal reflexes (Casey *et al.*, 2001; Montgomery, 2000). Each of criteria is marked between 0 and 2 and total score is 10. The sum of score ranged 7 to 10 means that the baby's general condition is good and there is no need of immediate medical intervention, 4 to 6 means moderately depressed and 0-3 severely depressed. It helps to identify neonates who require resuscitation and also to evaluate the effectiveness of resuscitation techniques (American Academy of pediatrics, 2015; Dutta, 2015).

The delivery mode is decided based on the various factors related to fetal and maternal health condition and similarly it has effect in the fetomaternal outcome after delivery. Study conducted by Rafiei *et al.*, (2018) shows that the risk of neonatal deaths after cesarean section is 4 times more than after normal vaginal delivery. In addition, neonates delivered by Cesarean delivery have APGAR score less than those of neonates delivered naturally. The most common complication in newborn by CD was transient tachypnea. Another study done by Lai *et al.* (2017) reported that cesarean delivery and instrumental vaginal delivery are associated with low to moderate APGAR score than normal vaginal delivery. However, the evidence regarding the association between mode of delivery and APGAR score is controversial (Khalid *et al.*, 2018; Rahmanian *et al.*, 2014). A study done by Kilsztajn *et al.* (2007) reported that compared to vaginal deliveries, neonates born through cesarean section had higher APGAR score. Similarly, study done by Fajar *et al.* (2017) suggested that CD have better neonatal outcome in breech presentation than NVD and found significant association between APGAR score and mode delivery. Whereas some researchers suggest that mode of delivery alone does not affect APGAR score (Burt *et al.*, 1998), in addition to this a number of other factors such as prematurity, low birth weight, maternal preeclampsia (Bakhsha *et al.*, 2016), maternal age (Almeida *et al.*, 2016; Straub, 2010), maternal education (Almeida, *et al.*, 2016), non-cephalic presentation, presence of meconium, Body mass index of mother (Lai *et al.*, 2017), type of pregnancy, parity (Straube *et al.*, 2010) are other important predictors of APGAR scores among newborns.

With understanding of the causes of low APGAR score among newborns, it provides the guidelines to prevent those

factors thus, reduce the morbidity and mortality of neonates which ultimately reduce the overall burden of health care system. This research study was carried out to determine the APGAR score of newborns born by two modes of delivery and its contributing factors. The findings of the study will be helpful for health care planner of maternal and child health so that better health care measures can be considered for better neonatal outcome.

## Methodology

In this study, to determine the association between APGAR score of newborns and two mode of delivery cross-sectional design with comparative approach was adopted. The study sample were 200 singleton babies (100 vaginal deliveries and 100 cesarean deliveries) selected using purposive sampling technique at Gandaki medical college teaching hospital and research centre (GMCTHRC), Pokhara. Data were collected from mothers for socio-demographic data and from the newborn birth record for APGAR score on 1<sup>st</sup> and 5<sup>th</sup> minutes after delivery following ethical principles. The data was collected for three months period from July to September 2019. To check the status of neonates, APGAR score 7 or more was considered appropriate and general condition of baby. The APGAR score less than 7 represented a critical condition which indicate immediate need of life supporting measures. Collected data were analyzed using descriptive statistics such as frequencies, percentages, mean and mean difference. As researcher has collect APGAR score from two independent group (NVD and CD) and wants to compare and find the association between APGAR score and mode of delivery, inferential statistics independent 't-test' had been used. To identify relationship with the associated factors for APGAR score chi square test has been used. The data were analyzed on SPSS -20 statistical software. The chosen significance level was 95%.

## Results and Discussion

The results of the study were summarized and presented as follows.

### *Part I: Description of baseline variables related to the mothers*

This part deals with the distribution of participants according to their demographic characteristics. Data is analyzed using descriptive statistics and are summarized in terms of percentage.

Data presented in the Table 1 reveals that majority (39%) of mothers are aged 26-30 years. Most (49%) are hindu. Majority (38%) are chhetri in ethnicity. Most (34%) mothers are educated till secondary level. Among them more (43.5%) are home maker. Majority (43%) mothers are primigravida. The mothers who are multigravida (114) more (61.5%) had delivered through normal vaginal delivery in previous delivery. Among 44 mothers who had

cesarean delivery in previous delivery majority (95.5%) had one-time cesarean delivery before. Most (54%) cesarean delivery among 100 babies are due to fetal related causes such as low birth weight, breech presentation, cord prolapsed, premature baby, fetal distress. Majority (58%) of mothers have weight between 50-90kg. Most (54%) newborn babies are male. Among them majority (78%) have birth weight between 2.5-4 kg. Most (81%) babies are born on term i.e. born between 37-42 weeks of gestation.

### **Part II: Assessment of APGAR score among newborns**

This part deals with the assessment of APGAR score among newborns born from vaginal delivery and cesarean delivery in 1<sup>st</sup> and 5<sup>th</sup> minute after birth.

Data presented in the Table 2 reveals that 88% and 95% of newborns have APGAR score more than 7 in 1<sup>st</sup> minute and 5<sup>th</sup> minute respectively after birth.

This finding was similar with the cross-sectional study done among 215 newborns with the objective to determine the

APGAR score of newborns with vaginal delivery and cesarean delivery and its relationship with associated factors in Gorgan health facility. The results of this study showed very closer data with previous report of Baksha *et al.* (2016) which is 92.5 and 94 percent of neonatal APGAR score in the 1<sup>st</sup> and 5<sup>th</sup> minutes were more than seven.

### **Part III: Comparison of APGAR score**

This part compares APGAR score among newborns in vaginal delivery and cesarean delivery in 1<sup>st</sup> and 5<sup>th</sup> minutes and it also deals with mean difference in vaginal delivery and cesarean delivery. To compare the APGAR score, a null hypothesis was formulated.

H01: There is no significant difference between APGAR score among newborns in vaginal delivery and cesarean delivery in 1<sup>st</sup> and 5<sup>th</sup> minutes after birth.

**Table 1:** Frequency and percentage distribution of sample according baseline variables (N=200)

S. N.	Baseline variables	Frequency	Percentage (%)
<b>1</b>	<b>Mother's Age in years</b>		
A	Below 20	32	16
B	20-25	62	31
C	26-30	78	39
D	31-35	28	14
<b>2</b>	<b>Religion</b>		
A	Hindu	98	49
B	Buddhist	82	41
C	Christian	20	10
<b>3</b>	<b>Ethnicity</b>		
A	Brahmin	44	22
B	Chhetri	76	38
C	Janajati	72	36
D	Dalit	8	4
<b>4</b>	<b>Education</b>		
A	Illiterate	12	6
B	Primary level	48	24
C	Secondary level	68	34
D	Higher secondary level	42	21
E	Bachelors level and above	30	15
<b>5</b>	<b>Occupation</b>		
A	Home maker	87	43.5

**Table 1:** Frequency and percentage distribution of sample according baseline variables (N=200)

S. N.	Baseline variables	Frequency	Percentage (%)
B	Daily wages	32	16
C	Private employee	45	22.5
D	Government employee	13	6.5
E	Own business	23	11.5
<b>6</b>	<b>Parity</b>		
A	I	86	43
B	II	72	36
C	III	34	17
D	IV and more	8	4
<b>7</b>	<b>Type of previous delivery (N=114)</b>		
A	Normal	70	61.5
C	Cesarean	44	38.5
<b>8</b>	<b>No of previous cesarean (N=44)</b>		
A	1	42	95.5
B	More than 1	2	4.5
<b>9</b>	<b>Cause of cesarean in this delivery (N=100)</b>		
A	Maternal related factors	34	34
B	Fetal related factors	54	54
C	Both related factors	12	12
<b>10</b>	<b>Weight of mother</b>		
A	Below 50 kg	18	9
B	50-90 kg	116	58
C	91 kg and above	66	33
<b>11</b>	<b>Sex of baby</b>		
A	Male	108	54
B	Female	92	46
<b>12</b>	<b>Weight of baby</b>		
A	Less than 2.5 kg	32	16
B	2.5-4 kg	156	78
C	More than 4 kg	12	6
<b>13</b>	<b>Maturity of baby</b>		
A	Born before 37 weeks	38	19
B	Born between 37-42 weeks	162	81

**Table 2:** Percentage distribution of assessment of APGAR score among newborns (N=200).

APGAR Score in 1 <sup>st</sup> minute	APGAR Score in 1 <sup>st</sup> minute		APGAR Score in 5 <sup>th</sup> minute	
	Frequency	Percentage	Frequency	Percentage
Less than 7	24	12	10	5
7 and more	176	88	190	95

**Table 3:** Comparison of APGAR score among newborns in vaginal delivery and cesarean delivery in 1<sup>st</sup> and 5<sup>th</sup> minute after birth

APGAR Score in 1 <sup>st</sup> minute	Normal delivery (N=100)			Cesarean delivery (N=100)			Mean difference	t-test
	Frequency	Percentage	Mean	Frequency	Percentage	Mean		
Less than 7	11	11	6.98	13	13	6.94	0.04	0.067*
7 and more	89	89		87	87			
<b>p&lt;0.05</b> * = Not Significant								
APGAR Score in 5 <sup>th</sup> minute	Normal delivery (N=100)			Cesarean delivery (N=100)			Mean difference	t-test
	Frequency	Percentage	Mean	Frequency	Percentage	Mean		
Less than 7	6	6	7.47	4	4	7.53	0.06	0.066*
7 and more	94	94		96	96			
<b>p&lt;0.05</b> * = Not Significant								

Data presented on Table 3 reveals that the mean APGAR score in 1<sup>st</sup> minute on normal vaginal delivery and cesarean delivery is less than 7 with mean difference of 0.04 and APGAR score in 5<sup>th</sup> minutes in both mode of delivery is more than 7 with mean difference of 0.06. To find out the difference in APGAR score in these two modes of delivery, independent 't-test' was done. The calculated t-value 0.067 and 0.066 for APGAR score in 1<sup>st</sup> and 5<sup>th</sup> minutes respectively is less than tabulated t value (p<0.05). Thus, null hypothesis was accepted and concluded that there is no significant difference between APGAR score among newborns in vaginal delivery and cesarean delivery in 1<sup>st</sup> and 5<sup>th</sup> minutes after birth.

In this study the mean difference of APGAR score among newborns from vaginal delivery and cesarean delivery was 0.04 and 0.06 in 1<sup>st</sup> and 5<sup>th</sup> minutes after birth. And there is no significant difference between APGAR score among newborns in vaginal delivery and cesarean delivery in 1<sup>st</sup> and 5<sup>th</sup> minutes after birth (t=0.067 and 0.066, p<0.05). The findings of study were supported by the case control study conducted on two hospitals of Jahrom, southern of Iran to compare 100 cesarean cases with 199 uncomplicated normal vaginal delivery. The aim of study was to determine the impact of cesarean section on APGAR score of babies

on birth. The study concluded that there was not any significant difference between mean APGAR score (8.63 ±0.79, 8.79± 0.94) at 5 minutes of birth from cesarean delivery and normal vaginal delivery (Rahmanian *et al.*, 2014).

#### **Part IV: Association between APGAR scores among newborns in 1<sup>st</sup> minute and selected baseline variables.**

Chi-square test was computed to test the association between the APGAR score among newborns in 1<sup>st</sup> minute and selected baseline variables; the following null hypothesis was formulated.

H02: There is no significant association between APGAR score of newborns in 1<sup>st</sup> minute and selected baseline variables.

Data presented on Table 4 shows that some factors such as age of mothers, no of parity, weight of mother, weight of baby and maturity of baby have significant association (p<0.05) with the APGAR score of newborns on 1<sup>st</sup> minute after birth. Hence the null hypothesis is rejected and concluded that there is significant association between APGAR score of newborns in 1<sup>st</sup> minute and selected baseline variables.

**Table 4:** Association between APGAR score with selected baseline variables (N=200).

S. N.	Baseline variables	$\chi^2$	Knowledge Df	Inference	Table value
1	Age of mothers in years	21.96	3	S	7.82
2	Religion	4.56	2	NS	5.99
3	Ethnicity	3.34	3	NS	7.82
4	Education	3.45	4	NS	9.49
5	Occupation	4.57	4	NS	9.49
6	No of Parity	11.94	3	S	7.82
7	Type of previous delivery	2.67	1	NS	3.84
8	No of previous C/S	1.05	1	NS	3.84
9	Cause of C/S	5.06	2	NS	5.99
10	Weight of mother	6.002	2	S	5.99
11	Sex of baby	2.34	1	NS	3.84
12	Weight of baby	19.03	1	S	3.84
13	Maturity of baby	23.96	1	S	3.84

df= Degree of freedom S= Significant; NS=Not significant

In this study, various factors such as age of mother, weight of mother, no of parity, weight of baby and maturity of baby have significant association with low APGAR score ( $\chi^2=21.96, 6.002, 11.94, 19.03$  and  $23.96$  respectively). These study findings were similar with the study conducted on Gorgan health facility with the aim to determine the APGAR score of newborns with vaginal delivery and cesarean delivery and its relationship with associated factors shows that factors such as low birth weight and maturity has effect on low APGAR score (Bakhsha *et al.*, 2016). Similarly, another study conducted with the aim to examine the relationship of APGAR score with maternal socioeconomic and biological factors among 465964 singleton pregnancies from 37-41 weeks from German perinatal statistics. Results showed that maternal age, BMI and parity had influence on APGAR score of newborns (Straube *et al.*, 2010).

## Conclusion

APGAR score is common and quick method for assessment of newborn's physical condition which can summarize the health of newborn against the NICU admission and mortality. The study concluded that the factors such as age of mother, weight of mother, no of parity, weight of baby and maturity of baby has significant association with APGAR score but there is no any association of mode of delivery in APGAR score of newborns.

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