Morbidity and immediate outcome of Small for Gestational Age infants born at term gestation

Sagun Khanal[1], Veena Gupta[2], Ashish Dahal[3]

[1]Department of Pediatrics, BP Koirala Institute of Health Sciences, Nepal.
[2]Department of Pediatrics, Nepalgunj Medical College, Nepal (Retired)
[3]Department of Anaesthesiology, Institute of Medicine, Nepal.

Corresponding Author: Dr. Sagun Khanal, Email id: khanal.sagun60@gmail.com;
ORCID iD: https://orcid.org/0009-0000-3347-2280. Email:

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ABSTRACT

Background: Small-for-gestational-age (SGA) is defined as birth weight below the tenth percentile according to a specific gestational age and sex reference. SGA babies are either due to symmetric or asymmetric intrauterine growth restriction.

Objectives: The study aims to evaluate the immediate outcome of the full term SGA neonates requiring neonatal intensive care unit (NICU) admission.

Methods: It was prospective cross-sectional study conducted between February 2018 and January 2019 in NICU of Nepalgunj Medical College Teaching Hospital, Kohalpur, Banke. Babies were evaluated daily for short term outcome till they were discharged from hospital.

Results: A total of 50 term SGA babies were included in the study. Most of the SGA babies needing admission to NICU were severe intrauterine growth restriction (IUGR). Among 50 cases 22 were male and 22 were female. Meconium-stained liquor was present in 20% during birth. Eighty two percent cried immediately, 4% cried after stimulation, 12% needed bag and mask ventilation and 2% were intubated at birth. The short term morbidities during NICU stay were birth asphyxia (14%), apnoea (8%), jaundice (30%), bleeding (2%), meconium aspiration syndrome (10%), neonatal sepsis (44%), transient tachypnoea of newborn (12%), hypoglycemia (6%). Four of the SGA babies expired due to severe sepsis. Asymmetrical intrauterine growth retardation (IUGR) babies were in 44% and symmetrical IUGR were in 56%. There was no significant difference in outcome of symmetrical and asymmetrical babies. Their final outcome was 92% discharged and 8% death.

Conclusions: Most of the SGA babies needing admission to NICU were severe IUGR. The most common morbidities seen was Neonatal sepsis followed by neonatal jaundice. The result of this study could be important to recognize the anticipated problems and areas requiring attention to improve quality of neonatal care of SGA babies in order to manage the problems associated with them.

Keywords: Small-for-gestational-age; neonatal intensive care unit; small for gestational age; hospital

INTRODUCTION

Birth weight is used as a yardstick of maturity and is an important determinant of the child survival and development [1]. Small-for-gestational-age (SGA) is defined as birth weight below the tenth percentile according to a specific gestational age and sex reference. SGA is used as a measurable proxy for intrauterine growth retardation (IUGR) [2]. Moderate and severe IUGR are defined as birth weight between 3rd to 10th percentile and less than 3rd percentile, respectively for particular gestational age and sex. Term babies are defined as 37 weeks gestation completed [3].

SGA infants are classified as symmetric and asymmetric. Symmetric IUGR begins early in gestation and has reduced length, weight and head growth. Baby is proportionately small; and ponderal index is usually two or more, so is also in babies with normal growth. Asymmetric IUGR begins late in gestation and has reduced body weight and relatively normal length and head growth [3]. Head circumference is generally more than 3 cm bigger than chest circumference in asymmetrical IUGR. Also, Ponderal index is less than two [2,4].

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Infants born small for gestation age are reported to have higher rates of neonatal mortality and morbidity than appropriate for gestational age infants [5]. By and large, most clinical problems and biochemical abnormalities are limited to severely growth retarded babies with birth weight less than 3rd percentiles. Major comorbidities associated with the SGA babies were respiratory distress (due to birth asphyxia and meconium aspiration), symptomatic hypoglycemia, jaundice, hypothermia, polycythemia, infections (sepsis) and bleeding manifestations (like pulmonary hemorrhage) [4].

SGA birth can cause significant morbidity and mortality in neonate. There is paucity of data related to SGA babies in Nepal especially in western Nepal. Since, Nepalgunj Medical College is the tertiary care hospital, large number of complicated pregnancies is referred here. By determining their outcome we can provide evidence of need for improved quality of care for these infants to increase survival. The aim of this study is to evaluate the short term outcome of the SGA neonates during their hospital stay.

METHODS

It was prospective cross-sectional study conducted between February 2018 and January 2019 in NICU of Nepalgunj Medical College Teaching Hospital, Kohalpur, Banke. All term neonates [37 to <42 weeks of gestation] weighing less than 10th percentile of weight for gestational age were admitted in NICU within 24 hours of birth that included both inborn/outborn, singleton/multiple gestation.

The exclusion criteria were preterm and post-term SGA babies, neonate admitted after 24 hours of birth, birth with congenital anomalies, and neonates of those mothers who were not willing to participate.

Neonate's weight was taken within 24 hours of birth without any cloth and on a digital weighing machine. Weight was taken twice from which mean weight was taken as reference. Length and upper and lower segment ratio of the neonate was taken by infantometer. Chest circumference of the neonate was taken. Head circumferences were taken after 24 hours when caput succedaneum and overriding of suture had disappeared. The gestational age was assessed by using date of last menstrual period and confirmed by Ballard scoring system.

The aberrant growth pattern was assessed by plotting the weight, length and head circumference against the gestational age on a standard fetal-infant growth chart [6]. A neonate whose weight falls between the 10th and <90th percentile was considered as appropriate for gestational age (AGA); if the weight falls below 10th percentile, as small for gestational age (SGA); and large for gestational age (LGA) for the weight at or above the 90th percentile for the gestational age [4].

Ponderal index (PI) was calculated by weight (in grams) divided by length cubed (cm^3), multiplied by 100. PI <2 was labelled asymmetrical IUGR and PI >=2 was symmetrical. SGA neonates were further categorized as moderate and severe IUGR, defined as birth weight in between 3rd to 10th percentile and less than 3rd percentile, respectively [4].

Neonates were daily monitored for vitals, respiratory distress, apnoea, hypothermia, hyperbilirubinemia, signs and symptoms of infection, hypoglycemia and lab reports. The clinical course was monitored until discharge, death or for a maximum of 7 days, whichever came first.

Data collection was done using proforma. All the data were entered and analyzed by using version 21 of Statistical Package for Social Science (SPSS). The p value is statistically significant if below 0.05 using Pearson chi-square test.

RESULTS

The total neonates admitted in NICU from February 2018 to January 2019 were 1891. Total numbers of term SGA admitted in NICU that one year were 54 (2.85%), among which 50 of them were eligible for study. The Male: Female ratio in case study population was 1:1.27, comprising 22 male (44%) and 28 female (56%) babies.

Out of 50 cases, 44 were inborn and 6 were outborn. Among those 6 outborn, 1 was born in other hospital, 3 were health post delivery and 2 were delivered in vehicle. Apgar score of 5 neonates was missing due to outborn delivery. The mean birth weight and length of SGA babies requiring NICU admission was 1686±303.6 grams and 43.56±3.03cms respectively. The mean head circumference and chest circumference of SGA babies admitted in NICU was 30.63±1.55cm and 26.136±1.68 cm respectively [Table 1].

The most common morbidities seen was Neonatal sepsis (44%), NNJ (30%) followed by birth asphyxia (14%), TTN (12%) and MAS (10%). The average duration of NICU stay was 3.44 days (1-14 days) and average duration of hospital stay was 5 days (1-14 days). [Table 2]

There was no significant difference in morbidity and mortality among asymmetrical and symmetrical SGA babies admitted in NICU. Three cases of symmetrical IUGR expired and cause of death was severe sepsis in two of them (NICU stay 8 and 4 days) and severe sepsis with pulmonary hemorrhage in other one (NICU stay 7 days). One case of asymmetrical IUGR expired and its cause of death was severe sepsis with bleeding (NICU stay 6 days) [Table 3].

DISCUSSION

In this study, total incidence of full term SGA was 2.85% of the total NICU admission in one year. This is similar to study done by Narang (3.53% born at all gestation were SGA) and Clausson (3.3% babies born at term gestation) but varies with the result of Rajbhandari (14-38.8% of babies born at all gestation were SGA), Ota E (17.9% babies born at all gestation were SGA) and KC et al (37.5% born at all gestation were SGA) [7-11]. Since our study is NICU based, and for term gestation only, incidence of SGA among all birth is not comparable. Similarly, 44% of SGA babies were male and 56% were female, M:F ratio was 1:1.27 which is similar to study done by Narang [7] (51.5% female) and Dey [12] (57% male and 43% female).

Forty percent of SGA babies were delivered via cesarean section in our study. In a study by Manandhar et al, 61.66% of SGA babies were delivered via cesarean section as both elective and emergency [13]. Sixteen percent of SGA babies were delivered via multiple pregnancies in the study of Dey, which is also consistent with our study [12].

In this study 24% had Apgar score <7 at 5 minutes. In the study by Benedict et al, the Apgar score below 7 was

Table 1: Characteristics of SGA babies (n=50)

Characteristics		Number	%
Sex	Male	22	44
	Female	28	56
Ethnicity	Brahmin/Chhetri	22	44
	Janajati	2	4
	Dalit	6	12
	Terai Adhiwasi	20	40
Place of birth	Hospital	45	90
	Health post	3	6
	Vehicle delivery	2	4
Mode of delivery	Spontaneous vaginal	23	46
	Induced vaginal	6	12
	Vacuum	1	2
	LSCS	20	40
Type of pregnancy	Single	42	84
	Multiple	8	16
Meconium stain liquor		10	20
Resuscitation at birth	Cried immediately	41	92
	Stimulation	2	4
	Bag and mask ventilation	6	12
	Intubation	1	2
Apgar score at 1 min	<7	24	48
	≥7	21	42
	Missing	5	10
Apgar score at 5 min	<7	12	24
	≥7	33	66
	Missing	5	10
Birth weight (grams)	2500-2000	11	22
	1500-1999	26	52
	1000-1499	13	26
Weight for gestational age	10^{th}-3^{rd} percentile	1	2
	<3^{rd} percentile	49	98
Ponderal index	<2 (asymmetrical)	24	48
	>=2 to <2.5 (symmetrical)	26	52

found in 2% of SGA babies at 5 min [14]. This difference in percentage is present as they have taken all newborns born in hospital and we have taken only those admitted in NICU. In the study by Manandhar et al 15% had APGAR < 7 at 5 minutes [13]. In our study 52% were between 1500-2000gm, and 26% were between 1000-1500gm which is similar to Dey study (52% were between 1500-2000gm, 3% were <1500gm) [12]. In our study, 98% of SGA babies admitted in NICU were below 3^{rd} percentile birth weight, signifying majority of moderate SGA could be managed in neonatal ward. In this study we had 14% birth asphyxia (BA) which corresponds with 21.36% BA seen in the study done by Anil Narang et al in India [7], 10% BA in the study in Bangladesh [12], 6.67% in Nepalese study [13], 14.28% in the study done by Ayha et al in India [14].

Table 2: Neonatal morbidities of SGA babies during NICU stay (n=50)

Morbidities	Frequency	Percent
Birth Asphyxia	7	14
Hypothermia	0	0
Apnoea	4	8
Neonatal hyperbilirubinemia (NNJ)	15	30
Bleeding manifestation	2	4
Polycythemia	0	0
Meconium aspiration syndrome (MAS)	5	10
Neonatal Sepsis	22	44
Transient tachypnoea of newborn (TTN)	6	12
Hypoglycemia	3	6
Mortality	4	8

Our study had 8% apnoea and 2% bleeding manifestation which differs from to 29% apnoea and 9% bleeding manifestation in the Bangladesh study done by Dey et al [12]. The NNJ was 30% in our study which is similar to 21.56% in Indian study [7]and 43% in a Bangladesh study[12], however differs to Nepalese study done by Manandhar et al [13] (5%) and Indian study done by Ahya et al[14] (7.14%).This study shows 10% MAS which higher than 3.3% MAS by Manadhar et al[13] and 0.5% by Benedict et al[15].

We had 44% NNS which corresponds to 54% in a study in Bangladesh [12], but contradict to 13.1% figure in a study at Texas, USA [16], 10% by Manandhar et al in Nepal [13] and 7% at Ohio, US [15]. Our study showed 12% TTN which is higher than 2% TTN in the study Benedict et al[15].We had 6% hypoglycemia which is similar to 6.8% hypoglycemia in the study done by A Narang [7], 5% in the study done by Benedict et al [15], 7.14% in the study done by Ayha et al [14] but less than Bangladesh study (25%) [12].

In our study, mortality was 8% which is similar to 5% in Benedict et al (US), 5.8% in Narang et al and 3.57% in Ahya et al (India); however, the figure was 17% in Dey et al (Bangladesh) [13-17]. Variable mortality has been observed in different study because of different morbidity pattern during stay.

Limitations The study was done in a single center and small sample size. Long term follow up could not be done after discharge and moderate IUGR not requiring NICU admission were not included.

Table 3: Neonatal outcome of asymmetrical V/S symmetrical SGA babies

Problems		Asymmetrical (n= 24)	Symmetrical (n=26)	P value
Birth Asphyxia	yes	4 (16.7%)	3 (11.5%)	0.697
	No	20 (83.3%)	23 (88.5%)	
Apnoea	yes	1 (4.2%)	3 (11.5%)	0.611
	No	23 (98.5%)	23 (88.5%)	
NNJ	yes	9 (37.55%)	6 (23.1%)	0.358
	No	15 (62.5%)	20 (76.9%)	
Bleeding	yes	1 (4.2%)	1 (3.8%)	1.0
	No	23 (95.8%)	25 (96.2%)	
Hypoglycemia	yes	2 (8.3%)	1 (3.8%)	0.602
	No	22 (91.7%)	25 (96.2%)	
MAS	yes	4 (16.7%)	1 (3.8%)	0.182
	No	20 (83.3%)	25 (96.25)	
Neonatal Sepsis	yes	11 (45.8%)	11 (42.3%)	1.0
	No	13 (54.2%)	15 (57.75)	
TTN	yes	4 (16.7%)	2 (7.7%)	0.409
	No	20 (83.3%)	24 (92.3%)	
Outcome	Death	1 (4.2%)	3 (11.5%)	0.365
	Discharged	23 (95.8%)	23 (88.55)	

CONCLUSION

The implication of the study is that the early detection of IUGR babies and timely management of anticipated problems can lead to good survival of SGA babies. It is recommended to have pediatric attendance and neonatal resuscitation services available during SGA birth. Parents can be counseled about the possible outcomes at the time of birth and be mentally prepared.

Author Contributions: Dr. Sagun Khanal reviewed the literature, conceptualized and designed the research, which was reviewed and approved by Prof. Dr.Veena Gupta. Dr. Sagun Khanal and Dr. Ashish Dahal did data collection, analyzed the data and prepare result. Dr. Sagun Khanal drafted the manuscript and intellectual content was added by Prof. Veena Gupta. All authors reviewed the manuscript and approved the final version of the manuscript. All authors agreed to be accountable for all aspects of the research work.

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Name of Registry and Registration number: Not applicable

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