ORIGINAL RESEARCH PAPER
VOLUME-6 | ISSUE-7 | JULY-2017 | ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

MORBIDITY PROFILE AND IMMEDIATE OUTCOME OF SMALL FOR GESTATIONAL AGE NEONATES IN A RURAL TERTIARY CARE HOSPITAL

Pediatrics

Dr. Manish Rasania Professor dept. of pediatrics, SBKS medical institute and research center, Dhiraj hospital, piparia, waghodia, vadodara

Dr. Sunil Pathak Assistant professor dept. of pediatrics, SBKS medical institute and research center, Dhiraj hospital, piparia, waghodia, vadodara. and corresponding author.

Dr.Sagar Patel Resident dept. of pediatrics, SBKS medical institute and research center, Dhiraj hospital, piparia, waghodia, vadodara

ABSTRACT

Background: Small for gestation age births are associated with adverse short term and long term health consequences. This study was conducted to identify risk of various neonatal morbidities and determination of short come outcome with comparison with average for gestational age (AGA) neonates.

Methods: This is a retrospective cohort study using previously collected data from neonates born at Dhiraj Hospital and SGA neonates who were born outside but admitted at SNCU of Dhiraj Hospital between January 2015 to December 2015. SGA neonates were analyzed for morbidities and immediate neonatal outcome. There morbidities and outcome were compared with AGA neonates.

Results: A total of 1236 in born live births and 28 out born SGA neonates admitted in SNCU were included in this analysis. 16.8% neonates were prematurely born. 39.15% were low birth weight. 7.12% were SGA. Morbidities were relatively higher in SGA neonates compared to AGA neonates. Birth asphyxia (11.3 % vs 4.9%), sepsis (13.6% vs 1.94%), RDS (9.1% vs 1.48%), MAS (2.27% vs 1.02%), PPHN (1.14% vs 0.27%), TTN (4.54% vs 3.24%), NEC(2.27% vs 0.27%), hyperbilirubinemia (23.8% vs 8.61%), polycythemia (2.27% vs 0%), hypoglycemia (4.54% vs 0.46%), major malformations (5.68% vs 0.55%), PDA (5.68% vs 1.02%). 7.95% of SGA neonates had poor immediate neonatal outcome compared to 1.66% in AGA.

Conclusions: Neonatal morbidities and mortality rates are remarkably higher among SGA neonates. Prompt identification of these conditions is needed to implement interventions aimed at increasing survival of these high-risk neonates.

KEYWORDS:

SGA: small for gestation age, morbidities, immediate neonatal outcome

Introduction

Gestational age of neonate is important determinant of his survival and future development. Even more important is his weight for that gestational age. SGA births are associated with adverse health consequences, including increased neonatal and infant mortality, childhood malnutrition, visual and hearing problems, and adulthood metabolic disease. [1,2,3] Small for gestational age (SGA) births are prevalent condition among newborns from low and middle income countries (up to 27% of all deliveries are SGA), with higher prevalence in South East Asia and Sahelian countries.[1,4] This study was conducted to identify risk of various neonatal morbidities and determination of short come outcome with comparison with AGA neonates with aim to be sensitized while dealing with SGA neonates with aim to reduce morbidities and mortalities.

Methods

This is a retrospective cohort study using previously collected data from neonates born at Dhiraj Hospital and neonates who were born outside but admitted at SNCU of Dhiraj Hospital between January 2015 to December 2015.

These neonates were examined, monitored and managed by standard protocols. Nude weight of neonate at birth or at arrival is taken by electronic weighing scale having ±1 gram accuracy. Gestational age is calculated using last menstrual period and new Ballard score. Neonates weighing less than 10th percentile of weight for gestational age on population specific growth chart were considered as small for age (SGA), and were analyzed for morbidities and immediate neonatal outcome. There morbidities and outcome were compared with average for gestational age (AGA) neonates.

This study is a retrospective analysis of previously collected information. Neonates were managed by standard protocols. This study was approved by the hospital ethics committee.

Results:

Table 1: General characteristics Of Inborn Live Births

Live births	1236
Full term	1025 (82.9%)
Preterm	208 (16.8%)
Post term	03 (0.24%)
Normal birth weight (2500 – 3500 gm)	722 (58.4%)
LBW (<2500 gm)	484 (39.15%)
Large weight (>3500 gm)	30 (2.42%)
AGA	1080 (87.3%)
SGA	88 (7.12%)
LGA	68 (5.5%)

During study period, total numbers of live births in our hospital were 1236. 1025 (82.9%) were full term, 208 (16.8%) were preterm and 3 (0.24) were post term. 722 (58.4%) neonates had normal birth weight, 484 (39.15%) had low birth weight, and 30 (0.24%) had large weight. Out of 1236 live births, 217 (17.55%) required SNCU admission. During study period, there were total 411 admissions in SNCU. 217 were inborn admissions, 189 were out born admissions and 5 were inborn readmissions.

Out of 1236 live births, 1080 (87.3%) were AGA, 88 (7.12%) were SGA and 68 were LGA (5.5%). Out of 1080 AGA 178 (16.5%) required SNCU admission. Out of 88 SGA neonates 37 (42%) required SNCU admission. Out of 68 LGA 2 (2.9%) required SNCU admission.

General characteristics of SGA neonates (Inborn And Outborn)

Out of 88 SGA inborn neonates, 37 (42%) required SNCU admissions. Out of 217 inborn admissions, 37 (17.05%) were SGA. Out of 189 out born SNCU admissions, 28 (14.8%) were SGA. Out of total 411 SNCU admissions admitted SGA neonates were 65 (15.8%).

Table 2: General characteristics of SGA neonates (Inborn And Outborn)

	Inborn total (88)	Inborn SNCU (37)	Outborn SNCU (28)
Post term	00	00	01
Full term	64 (72.73%)	14	11
Preterm	24 (27.27%)	23	17
Late preterm	13	12	09
Moderate preterm	05	05	02
Very preterm	06	06	05

Extreme preterm	00	00	00
>2500 gm	00	00	00
2000 – 2499	48 (54.5%)	06	11
1500 – 1999	26 (29.54%)	17	08
1250 – 1499	04 (4.54%)	04	02
1000 – 1250	07 (7.95%)	07	06
<1000	03 (3.4%)	03	01
Male	35 (39.7%)	17	12
Female	53 (60.2%)	20	16
Vaginal delivery	69	26	23
LSCS delivery	19	11	05

Out of total inborn SGA neonates, 64 (72.73%) were full term, while 24 (27.27%) were preterm. Majority of preterm were late preterm (13 out of 24). 21.8% of inborn full term SGA required SNCU admission. 95.8% of preterm inborn required admission. 11 (12.5 %) of inborn SGA neonates were VLBW. 3 (3.4%) were ELBW. 39.7% were male, while 60.2% were female. Need for SNCU admission was relatively less for female SGA neonates (female 37.7% vs male 48.6%).

Table 3: Morbidities of SGA neonates:

	INBORN SGA (TOTAL 88, SNCU 37)	OUTBORN SGA SNCU (28)	SGA SNCU (65)
Birth Asphyxia	10 (9+1 POST NATAL WARD) (04 MOD+06 SEV) (24.3%)	09 (32.1%)	18 (27.69%)
Mod – Sev HIE	02	07	09
Sepsis	12 (32.4%)	14 (50%)	26 (40%)
RDS	08 (21.6%)	07 (25%)	15 (23%)
MAS	02 (5.4%)	02 (7.14%)	04 (6.15%)
PPHN	01 (2.7%)	00	01 (1.54%)
TTN	04 (10.81%)	02 (7.14%)	06 (9.23%)
NEC	02 (5.4%)	01 (3.57%)	03 (4.61%)
Hyperbilirubinemia	21 (17+4 IN POST NATAL WARD) (45.9%)	05 (17.8%)	22 (33.8%)
Polycythemia	02 (5.4%)	02 (7.14%)	04 (6.15%)
Hypoglycemia	04 (10.81%)	01 (3.57%)	05 (7.69%)
Thrombocytopenia	00	03 (10.7%)	03 (4.61%)
DIC	00	02 (7.14%)	02 (3.07%)
Coagulopathy	00	02 (7.14%)	02 (3.07%)
Hyponatremia	00	01 (3.57%)	01 (1.54%)
Hypernatremia	01 (2.7%)	02 (7.14%)	03 (4.61%)
Hypocalcemia	00	01 (3.57%)	01 (1.54%)
ARF	00	06 (21.4%)	06 (9.23%)
Prerenal failure	00	01 (3.57%)	01 (1.54%)
Major malformations	05 (13.5%)	08 (28.57%)	13 (20%)
PDA	05 (13.5%)	02 (7.14%)	07 (10.76%)

Of 65 SGA neonates admitted in SNCU, 27.69% had birth asphyxia, 40% had sepsis, 23% had RDS, and 33.8% had hyperbilirubinemia. Other common morbidities were - MAS (6.15%), TTN (9.23%), PPHN (1.54%), NEC (4.61%), polycythemia (6.15%), hypoglycemia (7.69%). Major malformations were there in 20% cases and PDA in 10.76%. Morbidities were relatively higher in out born SGA neonates.

Table 4: Need for respiratory support for SGA neonates:

	INBORN (37)	**OUTBORN SNCU (28)**	**SGA SNCU (65)**
CPAP	04	02	06
CPAP + Venti	02	03	05
Venti	06	04	10
Total	12	09	21

Need for respiratory support aroused in 13.6% (12 out of 88) of inborn SGA neonates. Overall 32.3% of all admitted SGA neonates required respiratory support.

Table 5: Outcome of SGA neonates:

	INBORN SGA SNCU (37)	OUTBORN SNCU (28)	SGA SNCU (65)
Discharged	30	20	50
Death	01	02	03
DAMA	06	05	11
DAMA – NS	06	05	11
Death + DAMA – NS	07 (18.9%)	07 (25%)	14 (21.54%)
Transferred	01	01	02

Out of 88 inborn SGA neonates 7(7.95%) had poor outcome. Of admitted SGA neonates, 21.54% had poor outcome. Outcome was poorer in out born SGA neonates compared to inborn SGA (25% vs 18.9%).

Table 6: Comparison of morbidities of SGA neonates with AGA neonates:

	INBORN SGA (88, 37)	INBORN AGA (1080, 180)
Birth Asphyxia	10 (11.3%) (9+1) (04+06)	53 (4.9%)
Mod – sev HIE	02	13
Sepsis	12 (13.6%)	21 (1.94%)
RDS	08 (9.1%)	16 (1.48%)
MAS	02 (2.27%)	11 (1.02%)
PPHN	01 (1.14%)	03 (0.27%)
TTN	04 (4.54%)	35 (3.24%)
NEC	02 (2.27%)	03 (0.27%)
Hyperbilirubinemia	21 (17+4) (23.8%)	93 (55+38)(8.79%)
Polycythemia	02 (2.27%)	00
Hypoglycemia	04 (4.54%)	05 (0.46%)
Thrombocytopenia	00	02
DIC	00	05
Coagulopathy	00	01
Hyponatremia	00	01
Hypernatremia	01	02
Hypocalcemia	00	00
ARF	00	06
Prerenal failure	00	04
Major malformations	05 (5.68%)	06 (0.55%)
PDA	05 (5.68%)	11 (1.02%)

All the morbidities were relatively higher in SGA neonates compared to AGA neonates. Birth asphyxia (11.3 % vs 4.9%), sepsis (13.6% vs 1.94%), RDS (9.1% vs 1.48%), MAS (2.27% vs 1.02%), PPHN (1.14% vs 0.27%), TTN (4.54% vs 3.24%), NEC(2.27% vs 0.27%), hyperbilirubinemia (23.8% vs 8.61%), polycythemia (2.27% vs 0%), hypoglycemia (4.54% vs 0.46%), major malformations (5.68% vs 0.55%), PDA (5.68% vs 1.02%).

Of total 68 LGA neonates born, only 2 required SNCU admission. 66 LGA were full term, 2 were late preterm. Morbidities were least in LGA neonates. 1 had moderate birth asphyxia, and 6 had hyperbilirubinemia.

Table 7: Comparison of outcome of SGA neonates with AGA neonates:

	INBORN SGA (88, 37)	INBORN AGA (1080, 180)
Discharged	30 (81.08%)	157(87.22%)
Death	01	08
DAMA	06	14
DAMA – NS	06	10
Death + DAMA – NS	07 (18.9%) (7.95%)	18 (10%) (1.66%)
Transferred	01	01

Immediate outcome was poorer with SGA neonates compared to AGA neonates. Death cases and DAMA cases which are non-salvageable are together counted to consider poor outcome. Out of 88 inborn SGA births, 7.95% had poor immediate outcome, while it was 1.66% (18 out of 1080) in AGA neonates.

Amongst LGA neonates, there was no death or DAMA.

Table 8: Comparison of common morbidities and outcome between SGA and AGA neonates in relation to maturity:

	FT SGA	FT AGA	LATE PT SGA	LATE PT AGA	OTHER PT SGA	OTHER PT AGA
	64	898	13	153	11	29
SNCU admission	14 (21.8%)	94 (10. 46%)	12 (92.3%)	57 (37.2%)	11	29
Asphyxia	06 (9.37%)	36 (4%)	02 (15.3%)	08 (5.22%)	02 (18.18%)	08 (27.58%)
SEPSIS	03 (4.68%)	08 (0.89%)	01 (7.69%)	07 (4.57%)	08 (72.7%)	05 (17.24%)
RDS	01 (1.56%)	00	00	03 (1.96%)	07 (63.6%)	13 (44.8%)
MSAF	15 (23.4%)	122 (13.5%)	03 (23%)	07 (4.57%)	00	00
MAS	02 (3.12%)	10 (1.11%)	00	00	00	00
Death + DAMA - NS	02 (3.1%)	05 (0.55%)	00	01 (0.65%)	05 (45.45%)	12 (41.38%)

Further analysis was done in relation to maturity of neonates. Comparison of full term SGA and full term AGA shows relatively lesser hospitalization rate, lesser morbidities and better outcome in full term AGA neonates. Need for SNCU admission was 10.46% in full term AGA, while 21.8% in full term SGA. Incidence of birth asphyxia was 4% in full term AGA, as against 9.37% in full term SGA. Rate of sepsis was 0.89% in full term AGA as against 4.68% in full term SGA. MSAF was present in 13.5% of full term AGA with risk of MAS of 1.11%, as against 23.4% & 3.12% in full term SGA. There was a case of RDS in FT SGA neonate as compared to no case in FT AGA, which is difficult to explain. Poor outcome was noted in 0.55% of full term AGA as compared to in 3.1% in full term SGA.

Comparison between late preterm SGA and late preterm AGA shows more need of SNCU admission, higher rate of asphyxia, sepsis rate in late preterm SGA. Risk of RDS was relatively less in late preterm SGA. There was 1 death in late preterm AGA, while no death in late preterm SGA.

Rate of asphyxia was more (27.58%) in other preterm (moderate, very, extreme preterm) AGA compared to 18.18% in SGA. Rate of sepsis was higher in other preterm SGA compared to AGA (72.7% vs 17.24%). Incidence of RDS was 63.6% in other preterm SGA as compared to 44.8% in other preterm AGA. There was not much difference in immediate poor outcome in these groups.

Discussion

SGA is defined as having birth weight less than two standard deviations below mean or less than the 10th percentile of a population specific birth weight for specific gestational age. SGA is further divided into moderate (birth weight from third to tenth percentile) and severe (birth weight less than third percentile).[5] According to report on state of newborn health in India, prevalence of SGA is 46.7%, higher than all but two countries in the world (Pakistan & Mauritania have a marginally higher prevalence at 47%).[6] According to NNPD report 2002-2003, SGA infants formed 9.65% of all live births.[7] These neonates are faced with many problems after birth. They may have difficult cardiopulmonary transition with perinatal asphyxia, meconium aspiration, or persistent pulmonary hypertension. Immediate neonatal complications include hypothermia, hypoglycemia, hyperglycemia, hypocalcemia, polycythemia, jaundice, feeding difficulties, feed intolerance, necrotizing enterocolitis, late onset sepsis, pulmonary hemorrhage and so on. [8,9] The likely long term complications are growth retardation, major and subtle neurodevelopmental handicaps, and developmental origin of health and diseases.[5]

Katz et al. in a pooled analysis of 20 cohorts from Asia, Africa, and Latin America studied the mortality risk in preterm and small for gestational age infants in low and middle income countries. In comparison with term AGA infants, the RR for neonatal mortality was 1.83 (95% CI 1.34 – 2.50) and post neonatal mortality RR was 1.90 (1.32 – 2.73) for SGA infants. The risk of mortality was maximum in babies who were both preterm and SGA in comparison to babies who were either SGA or preterm alone (15.42; 9.11 – 26.12).[8,10]

Deorariet al. in their study on 144 SGA babies, the most common morbidities was hypoglycemia (17%) and polycythemia (10%).[8,11]

In a study conducted at a tertiary care hospital at Dhaka by Arun Chandra Dey, the main problems associated with SGA babies were perinatal asphyxia (65.5%), sepsis (54%), jaundice (42%), hypothermia (31%), apnea (29%), and bleeding manifestations (9%). Dogra et al. conducted a prospective observational study to measure incidence of feed intolerance and necrotizing enterocolitis in preterm neonates with umbilical artery Doppler flow in comparison with gestation matched AGA neonates. There was a trend towards more feed intolerance (22% vs 12%, p=0.183), NEC (12% vs 6%, p=0.295) and mortality (8% vs 2%, p=0.362) in SGA group and these babies also had significantly more hypoglycemia (p=0.000) and polycythemia (p=0.032) and longer hospital stay (p=0.017).[8,12]

Study conducted by Li-Yi Tsai on the impact of small for gestational age on neonatal outcome among very low birth weight infants, the SGA group was associated with increased risks of mortality (OR 1.89 (95% CI 1.39 – 2.58), severe ROP (OR 1.56; 95% CI 1.13 – 2.14), and BPD (OR 2.08; 95% CI 1.58 – 2.75) compared to AGA group. [13]

Study by Alberto L. Garcia-Basteiro, during neonatal period preterm delivery and SGA were associated with 13 (HR: 13.0, 95% 4.0 – 42.2) and 5 times (HR: 4.5, 95% CI 1.6 – 12.6).[1]

In present study, 16.8% neonates were prematurely born. 39.15% were low birth weight. 7.12% were SGA.

Majority (84.04%) of SGA neonates were weighing more than 1500 grams. More number of female infants were SGA with male female ratio of 39.7:60.2; but there was higher need for hospitalization for male infants.

The risks of morbidities were higher in SGA neonates compared to AGA. All the morbidities were relatively higher in SGA neonates compared to AGA neonates. Birth asphyxia (11.3 % vs 4.9%), sepsis (13.6% vs 1.94%), RDS (9.1% vs 1.48%), MAS (2.27% vs 1.02%), PPHN (1.14% vs 0.27%), TTN (4.54% vs 3.24%), NEC(2.27% vs 0.27%), hyperbilirubinemia (23.8% vs 8.61%), polycythemia (2.27% vs 0%), hypoglycemia (4.54% vs 0.46%), major malformations (5.68% vs 0.55%), PDA (5.68% vs 1.02%).

Compared to inborn admitted SGA neonates morbidities were higher among out born SGA neonates.

7.95% of SGA neonates had poor immediate neonatal outcome compared to 1.66% in AGA.

Several studies suggested lower risk of RDS in SGA infants compared to AGA infants. In present study, risk of RDS was low in late preterm SGA compared to late preterm AGA; but it was higher among preterm less than 34 weeks of maturity. (SGA 63.6% vs. AGA 44.8%). More sample size is required for better analysis.

Comparing full term SGA with full term AGA & late preterm SGA with late preterm AGA; higher need for SNCU admission, higher morbidities (asphyxia, sepsis, meconium aspiration) and poor immediate outcome was found in SGA.

Among moderate and very preterm AGA neonates slight higher rate of asphyxia (AGA 27.58% vs. SGA 18.18%) was found, with relatively less significant difference in immediate poor outcome (AGA 41.38% vs. SGA 45.45%). It can be because of differences in sample characteristics.

Conclusion

Neonatal morbidities and mortality rates are remarkably higher among SGA neonates. Prompt identification of these conditions is needed to implement interventions aimed at increasing survival of these high-risk neonates.

Abbreviations:

AGA: Average For Gestation Age, SGA: Small For Gestation Age, LGA: Large For Gestation Age, SNCU: Sick Newborn Care Unit, HIE: hypoxic ischemic encephalopathy, RDS: respiratory distress syndrome, MAS: meconium aspiration syndrome, PPHN: persistent pulmonary hypertention,TTN: transient tachypnoea of newborn, NEC: necrotising enterocolitis, DIC: Disseminated intravascular coagulopathy, ARF: acute renal failure, PDA: patent ductus arteriosus,

References

1. Garcia-Bateiro AL, Quinto L, Macete E, Bardaji A, Gonzalez R, Nhacolo A, et al. (2017) Infant mortality and morbidity associated with preterm and small for gestational age births in Southern Mozambique: A retrospective cohort study. PLoS ONE 12(2): e0172533.doi:10.1371/journal.pone.0172533 February 2017
2. Kozuki N, Katz J, Lee ACC, Vogel Jp, Silveria MF, Sania A, et al. Short maternal stature increases risk of small for gestational age and preterm births in low and middle income countries: Individual participant data meta-analysis and population attributable fraction. J Nutr. 2015; 145:2542 -50. Doi:10.3945/jn. 115216374 PMID: 26423738
3. Saigal S, Doyle LW. An overview of mortality and sequelae of preterm birth from infancy to adulthood. Lancet (London, England). 2008; 371:261-9
4. RE. Global prevalence of small for gestational age births. Nestle Nutr Inst Work Ser. 2015; 81: 1 – 7.
5. Deepak Sharma, Sweta Shastri, Pradeep Sharma. Intrauterine growth restriction: antenatal and postnatal aspects. Clinical medicine insights: Pediatrics 2016:10, 67-83
6. MJ Sankar, SB Neogi, J Sharma, M Chauhan, R Srivastava, PK Prabhakar, AKhera,R Kumar, S Zodpey and VK Paul. State of newborn health in India. Journal of Perinatology (2016) 36, S3 – S8;doi:10.1038/jp.2016.183
7. National Neonatal Perinatal Database 2002-03, NNPD Network. Supported by Indian Council of Medical Research, New Delhi, Nodal Center, AIIMS, New Delhi. http://www.newbornwhocc.org/pdf/nnpd_2002-03.PDF
8. Srinivas Murki, Deepak Sharma. Intrauterine Growth Retradation – A review article. J Neonatal biology 2014,3:3, 1000135
9. Anderson MS, Hay WW (1999) Intrauterine growth restriction and small for gestational age infant. In:Neonatology pathophysiology and management of the newborn (5thedtn) Lippincott Williams and Wilkins, Philadelphia.
10. Katz J, Lee AC, Kozuki N, Lawn JE, Cousens S, et al. (2013) Mortality risk in preterm and small for gestational age infants in low income and middle income countries: a pooled country analysis. Lancet 382; 417-425.
11. Deorari AK, Agarwal R, Paul VK (2008). Management of infants with intrauterine growth restriction. Indian J Pediatr 75; 171-174
12. Dogra S, Mukhopadhyay K, Narang A (2012). Feed intolerance and necrotizing enterocolitis in preterm small for gestational age neonates with normal umbilical artery Doppler flow. J Trop Pediatr 58:513-516.
13. Science direct Li-Yi Tsai, Yi-Ling Chen, Kuo-Inn Tsou, Shu-Chi Mu. The impact of small for gestational age on neonatal outcome among very low birth weight infants. Pediatrics and Neonatology (2015) 56, 101 – 107