

High Altitude, High Risks: A Retrospective Study of Premature infants admitted in a Sick Newborn Care Unit at High Altitude

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Abstract

Objective: To study the morbidity profile of preterm infants admitted at SNCU at an altitude of 3500 meters from sea level.

Methods: A Retrospective hospital based clinical observational study was done at the SNCU of SNM hospital Leh India situated at an altitude of [3500 meters] from sea level. Data regarding preterm births, clinical presentation, gestation, birth weight, maternal risk factors, morbidities & complications were recorded.

Result: Out of the 183 preterm babies admitted in the SNCU, the maternal risk factors for prematurity identified were PIH (37%) and Anaemia (19%). Birth weight and gestation wise most babies were in the weight category of 1500 to 1999 grams & 34-37 gestational weeks (53.5% & 57.9% respectively). SGA babies comprised 36% of the study population. Hyaline Membrane disease (RDS) was the most common morbidity (45%) observed in the study population followed by Neonatal Jaundice (39%) & Perinatal Asphyxia (20%).

Conclusion: Most common morbidities were RDS and NNJ and the maternal risk factors for preterm births were PIH and Anaemia. SGA babies comprised large chunk of study population (36%).

Keywords: Pregnancy Induced Hypertension (PIH); Premature infants; High altitude; Retrospective Study

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Introduction

Preterm births constitutes 11% of all deliveries in the world. Most of the high prevalence of premature birth is concentrated in resources limited places like Asia and Africa. Number of factors have been linked with high incidence of preterm births like maternal anaemia, malnutrition, multigravida pregnancy, Pregnancy Induced Hypertension (PIH), Chorioamnionitis etc. Survival of premature infants has increased over the last three decades with the advance of neonatal care and improved pregnancy care. Long term problems associated with prematurity especially cerebral palsy, vision and hearing disabilities are becoming more common these days due to high rate of survival of extremely and very low birth weight babies. There has been lack of studies over high altitude factor contributing to the morbidities of the premature infants.

This study was done at a Sick Newborn Care Unit (SNCU) located at 3500 meters from sea level with barometric pressure of air 493 mmHg with equivalent Fractional concentration of Oxygen (FiO₂) of only 14% to know whether high altitude contributes to the morbidities of preterm infants especially the respiratory morbidities.

Materials and Methods

A Retrospective clinical observational hospital based study was conducted enrolling preterm infants admitted to the SNCU of

SNM hospital Leh India (a level II NICU) for various reasons over four years between 2016 to 2020. The data included both inborn and outborn premature babies with gestational age less than 37 completed weeks. Babies with gestational age more than 37 completed weeks & less than 26 weeks, birth weight less than 500 grams and presence of lethal congenital anomalies were excluded from the study. Preterm infants who were expired, referred to higher centres for various reasons and who left the hospital against medical advice were also excluded from the study.

Data Analysis

Case records of the preterm neonates who were admitted to the SNCU were retrieved. Data regarding neonates's weight, gestational age, presenting complains, sex, apgar score, maternal risk factors, complications etc were recorded. Data was analysed using SPSS version 17.0, Microsoft Excel & Microsoft Word. Qualitative variables are expressed in terms of Percentage, Mean and Range. Ethical Approval was obtained from Hospital Ethical committee.

Results

A total of 183 preterm babies were included in the study (Table 1), which was done at SNM Hospital Leh Ladakh. The only referral hospital for Leh region. Mean birth weight of preterm infants was 1749 gms with standard deviation of 330 gms

(Table 2) and mean gestation age was 33.6 weeks with standard deviation of 2.3 weeks (Table 3). There were 97 males and 86 females. 6.5% of mother were diagnosed as chorioamnionitis before delivery. 51% of babies were born by normal vaginal delivery and 49% were born by LSCS.

Regarding Apgar score of preterm babies at 1 Minute , 61% of babies had A/S score more than 7, 33% had Apgar score of less than and equal to 6 and 6% of babies having Apgar score of 3 and below recorded.

Most common maternal risk factor identified for prematurity were PIH (37%) followed by maternal Anaemia 19%,

Primigravida 12%, UTI 10% and multiple births and PPROM 8% each (Table1). There were two Triplet deliveries and 14 twin deliveries. There were 22 (12%) mothers from low altitude areas who delivered premature babies at the facility.

Majority of LBW babies (53.5%) had birth weight between 1500 to 1999 grams and least had birth weight >2000 grams with range from 780 grams to 2501 grams (Table 2).

Majority of low birth babies had gestation age between 34-37 weeks. And only 5.5% had gestation age between 26-29 weeks with range from 26 weeks to 36+4 weeks. 36% of babies comprised SGA babies (Table 3).

Maternal Risk Factors	Frequency (n)	Percentage (%)
Maternal Age		
< 25	48	26
26-35	108	59
>35	27	15
Multiple Births	16	8
PPROM >24 hours	15	8
APH	13	7
PIH	69	37
UTI	18	10
GDM	6	3
Polyhydramnios	2	1
Oligohydramnios	8	4
Anaemia	36	19
Primigravida	23	12
Grand-Multipara	8	4
Note: PPROM: Preterm Premature rupture of membrane; APH: Antepartum Haemorrhage; PIH: Pregnancy Induced Hypertension; UTI: Urinary Tract Infection; GDM: Gestational Diabetes		

Table 1: Maternal Risk factors associated with Prematurity.

Group	Baby weight in grams	n	%
1	<1499	43	0.235
2	1500-1999	98	0.535
3	>2000	42	0.23

Table 2: Distribution of study population as per birth weight.

Gestation age	No of babies(n)	Percentage (%)
26-29 weeks	10	5.5
30- 33 weeks	67	36.6
34- 37 weeks	106	57.9
AGA	112	61.2

SGA	66	36
LGA	5	2.7
Note: AGA: Appropriate for Gestational Age; SGA: Small for Gestational Age; LGA: Large for Gestational Age		

Table 3: Distribution of study population as per Gestational age.

RDS was the most common morbidity observed (45%) followed by Neonatal jaundice 39%, Perinatal Asphyxia 30% , Feed Intolerance 20% , Sepsis 9.3%, BPD 6% and others including Hypoglycaemia, NEC and other congenital defects comprised 9%. IVH was least i.e 0.5% only (Table 4).

Oxygen only was needed in 86% of preterm babies in varying concentrations depending upon clinical status, followed by CPAP 42% and Intratracheal Surfactant 17% for Moderate to Severe HMD. Two Percent of preterm babies were given invasive ventilation. The Study revealed 45% babies developing HMD (Table 5).

Discussion

The present study was aimed at to find out whether Very High Altitude (3500 meters from sea level) has any impact on the morbidities and risks associated with preterm infants. In the

Study population, we found 26% of the premature infants were born to mothers with age less than 25 years and 59% to 26-35 years and 15 % to mothers with age more than 35 years. The High percentage of babies in the study population between mothers age 26-35 is in contrast to other studies like Florent Fuchs et al., [1] where highest incidence were among maternal age more than 35 years. Pregnancy Induced Hypertension was single highest maternal risks 37% followed by Anaemia 19%, Primigravida 12% and UTI 10%. High Altitude is significant risk factor for systemic Hypertension in adults [2]. This was in contrast to study done in USA by Ananth CV et al., where the cause of premature delivery was found Idiopathic 40-50%, PPROM in 30% and Medical indications in 15%-20% [3]. Out of 183 babies majority (53.5 %) were among the birth weight group 1500-1999 grams. It was high as compared to Emel Altuncu et al., (10.7%) and Kayastha et al., (9.8%) at low Altitude [4]. Among the enrolled babies in the study majority

Morbidity	<1499gms	1499-1999 gms	>2000 gms	Total(n-183)
	n-43,%	n- 98, %	n-42, %	
RDS	33(76)	35(35)	15(35)	83(45%)
Sepsis	1(2.3)	9(9.2)	7(17)	17(9.3)
CHD	2(4.6)	2(2.0)	3(7.1)	7(3.8)
NNJ	15(35)	38(39)	19(45.2)	72(39.3)
IVH	1(2.3)	0(0)	0(0)	1(0.5)
BPD	9(21)	2(2)	0(0)	11(6)
P. Asphyxia	23(53)	20(20)	12(28)	55(30)
AOP	5(11)	1(1)	0	6(3.2)
Feed Intolerance	23(53)	12(12)	3(7)	38(20)
Others	3(7)	12(12)	2(4)	17(9)
Note: RDS: Respiratory Distress Syndrome; CHD: Congenital Heart Defect; NNJ: Neonatal Jaundice; IVH: Intraventricular Haemorrhage; BPD: Broncho-Pulmonary-Dysplasia; AOP: Apnea of Prematurity.				

Table 4: Morbidity Profile of Preterm babies.

Respiratory Support	Frequency (n)	Percentage (%)
Oxygen by Hood	157	86
Bubble CPAP	77	42
Surfactant	31	17
Invasive Ventilation	4	2

Table 5: Respiratory support given to preterm babies in hospital.

(57.9%) were born at gestational age 34-37 weeks. According to Tommy's Premature birth statistics 85% of preterm babies were born in UK between gestational age 32-37. 36% of the babies were small for gestational age category. This was in contrast to Vinayak K et al., who found SGA in 27% of 140 babies studied in India. & according to the prevalence of SGA were 23% in South Asia [5].

45% of the study population had RDS. Among them 24% had mild, 20% moderate and 2% had severe RDS depending upon clinical, radiographic and need of therapy used. It showed 40.6% incidence of RDS in the 613 preterm infants admitted in NICU [6]. Alok Kumar et al., found HMD in 22.7% of Preterm babies admitted for respiratory Distress [7]. In the study 50 babies (30%) had Clinical evidence of HIE and needed resuscitation at birth. Highest incidence (53%) were among babies weighing less than 1499 grams. Fetzhardinge et al., also found incidence of HIE in such babies at 30% while reported the incidence of HIE 29% [8,9]. NNJ requiring treatment was found among 39.3% of the study population. Manikyamba D et al., found significant jaundice among 42% of such babies [10]. Anil Narang et al., too found high incidence of NNJ in Preterm babies [11]. Sepsis was diagnosed clinically in 9.3 % of the study population. The true incidence may not have been reflected due lack of blood culture and other investigations at the facility. Congenital heart defect diagnosed with significant cardiac murmur (systolic grade 3 or more, diastolic murmur) and other clinical criteria with radiology and Echocardiogram was found in 3.8% of the study population. However due to the lack of Expert/Neonatal Echo, the true incidence and type of CHD may have been missed in the study. BPD was found in 6% of the study population with highest incidence among babies weighing less than 1499 grams and 32 weeks gestational age (21%) and in 2% of babies weighing above 1499 grams. WH Northy Jr et al., found BPD incidence in babies weighing less than 1500gram in 24% and above 1500gram at 6% [12]. Mohammed A. AlShehri found the incidence of BPD in 28.6% of babies at High altitude [13]. The incidence of other common morbidities like Apnea of Prematurity, NEC, feed intolerance and other congenital and metabolic problems were almost similar with other published studies [14-21].

Conclusion

In our series reduction of the preventable and treatable maternal causes like Anaemia, PIH found to be among the largest causes of prematurity. Despite the widespread use of Antenatal steroid as strategy to reduce incidence of RDS, RDS was the single most important morbidity in the study population. High proportion of babies were SGA category. The establishment of the SNCU at the Hospital located at very high altitude remotely located place of India, introduction of CPAP, Surfactant, Invasive Ventilation, Caffeine therapy, Pharmacologic closure of PDA, titrated Oxygen therapy, modern phototherapy units, judicious use of antibiotics, exclusive breast feeding & KMC to these newborns have significantly improved the outcome of these babies during the

last few years. Further vigorous research and studies are needed to establish the normal values of Oxygen saturation and other physiologic parameters at birth and subsequently in both preterm and term babies at this Altitude and the optimal FiO₂ needed to resuscitate and treat these babies needing supplemental Oxygen [14-19].

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