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Congenital diaphragmatic hernia, neonatal, prognostic factors.

STUDY OF OUTCOME IN CONGENITAL DIAPHRAGMATIC HERNIA IN NEONATES

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ABSTRACT

Aim: The aim of this study was to analyze the neonates treated for congenital diaphragmatic hernia and to study the prognostic factors affecting the outcome. Settings and Design: The study was a retrospective study of CDH admitted in our Institute from January 2014 to Dec 2019. **Materials and Methods:** All cases of CDH undergoing surgery in our hospital were included. Babies who had eventration of the diaphragm were not included **Results :** One hundred and forty cases (68% Males, 54 % inborn, and 75% > 37 weeks) were studied. Mean Birth weight was 2855 570.60 g and mean gestational age was 37.55 1.75 weeks. The survival rate was 61%. Factors adversely affecting outcome were herniation of liver or stomach (p<0.05), low APGAR score at 5 min (<5), presence of moderate to severe PPHN (p<0.001) , presence of shock (p<0.003),low partial pressure of oxygen, high alveolar – arterial oxygen gradient and high oxygenation index. **Conclusion:** Morbidity rates were higher in newborns with low Apgar score, moderate to severe PPHN, need for hi gher ventilatory settings in our institution. Antenatal diagnosis failed to influence the outcome.

INTRODUCTION

The reported incidence of congenital diaphragmatic hernia (CDH) in our country is 1 out of every 2000 to 4000 live births. CDH is defined as a diaphragmatic defect with herniation of abdominal viscera causing hypoplasia of ipsilateral lung. Infants with CDH are more likely to be premature, macrosomic and male. Survival of infants with CDH ranges from 45% to 60.85% across various centres.

The present study is a retrospective study done in our Institute to analyse factors affecting survival.

MATERIAL AND METHODS:

All neonates who were diagnosed with CDH from January 2014 to December 2019 and admitted in SNN/Pediatric surgery were included.

Exclusion Criteria:

Neonates with eventration of diaphragm were excluded.

Treatment Strategy:

All resuscitations were done by pediatric resident in emergency OT. Babies with antenatal diagnosis were electively intubated and shifted to NICU for tertiary care.

All neonates are ventilated with pneumovent ventilator (|schiller) using conventional mode, without muscle relaxtants.

Sildenafil citrate (1-3 mg/kg/wt) were used in neonates with high oxygenation index (01>20) Besides chest X ray, 2 D echo, and ABG were obtained Fentanyl at a dose of 2-4 µg/kg/hr was used as analgesia for all neonates and shock was managed with 10m l/kg fluid bolus with inotrops.

Neonates undergo surgical correction after stabilisation and fall in pulmonary hypertension (Preductal SpO2 > 90% , FiO2 < 50% on conventional ventilator and repeat 2D ECHO shows pulmonary pressure < 2/3 rd of systolic BP)

All neonates underwent open repair by thoracic approach via 9th intercostal space.

Factors Collected:

Factors collected for analysis include gestational age of antenatal diagnosis, sex, Apgar score, associated anomalies, site of defect and timing of surgery.

Clinical parameters such as Persistent Pulmonary Hypertension of the newborn (PPHN), shock, pneumothorax, oxygenation index, alveolar – arterial oxygen gradient and ventilatory setting were recorded.

Definitions used

Persistent pulmonary hypertension is classified into Mild: Estimated right ventricular pressure (RV) < 2/3rd of systolic BP.

Moderate: Estimated RV pressure > 2/3rd of the systolic BP

Severe: Estimated RV pressure is more than systolic BP

Shock: pH<7.25 and urine output <1ml/kg/hr

Presurgical OI, highest AaDO2 and best partial pressure of oxygen (PaO2) were collected along with ventilatory settings Statistical analysis was done using chi-square test and Fisher's exact test.

p<0.05 was considered statistically significant.

RESULTS:

Basic details:

140 cases diagnosed with CDH were taken up for study, out of which 74 cases were inborn (53.3%).

Mean gestation age at birth and birth weight was 37.12 1.76 weeks and 2726.22 579.67 gm respectively. Seventy eight cases (55.71%) were diagnosed antenatally with mean gestation at diagnosis slightly later in the survivor group (31.1 4.88 weeks vs 27.2 4.54 weeks) in the non survivor groups.

One twenty six (90%) neonates were affected on the left side and fourteen (10%) had a defect on the right side.

The survival rate was 61% Thirty six (65.4%) patients expired before surgery and 18 (33.3%) patients expired after surgery(Table 1).

Associated cardiac anomalies were ASD, VSD and PDA.

Ventilatory factors:

Mean airway pressure (MAP) and FiO2 were more in non survivors prior to repair (Table2) Adverse prognostic factors in ventilation were low PaO2 and high AaDO2 and OI.

Table 1: Factors associated with morality

Parameters	Survivors (n=85)	Nonsurvivors (n=55)	P
Male	56 (66.6%)	34(60.61)	1.00
>37 weeks	33(38.8%)	18(33.31)	0.76
>2.5 kg	66(77.7%)	36 (66.61%)	0.50
LSCS	76 (88.8%)	50(91.6%)	0.577
Antenatal detection	38 (44.44%)	41(75%)	0.098
Content of hernia (stomach/liver)	9(11.11%)	41(75%)	<0.001
Apgar <5 at 5 min	5(5.55%)	32(58.33%)	0.003
Moderate-to—severe PPHN	14(16.66%)	55(100%)	<0.001
Shock	42(50%)	55(100%)	0.003
Pneumothorax	9(11.11%)	14(.41.66%)	0.05

Table 2:Ventilatory parameters

Parameter	Outcomes		p
	Survived	Non survivors	
MAP, mean±SD	9.79±2.78	12.52±1.99	<0.0001
FiO2, mean±SD	60.69±22.2	90.00±19.49	<0.0001
pH, mean±SD	7.302±0.08	7.215±0.16	0.221
pCO2, mean±SD	44.68±14.6	56.75±25.3	0.458
PaO2 , mean±S/D median (IQR)	134.5±59.99	50.1 (24-62.5)	<0.0001

Operative and Postoperative care:

All neonates in our Institute undergo surgical correction via thoracic open approach via 9th ICS. Median age for surgery was 50 hour with interquartile range of 48-72h in survivors and mean age of 54 5.89h in non survivor groups.

5 patients developed postoperative wound infection and were treated with appropriate antibiotics with culture reports. 3 neonates developed early post operative recurrence which subsequently underwent mesh repair.

10 neonates developed postoperative pneumothorax on the contralateral side which required ICD tube placement.

Low Apgar score at 5 min, presence of moderate to severe PPHN, higher ventilatory settings and shock were associated with poor outcome.

Antenatal diagnosis did not alter survival rate.Majority of Non survivors expired within 10 days of admission.

DISCUSSION:

The present retrospective study in our Institute shows survival rate of 61%. Studies done from developed countries have shown a survival rate of > 85% with protocolized care[5].

We did not find any significant difference in survival in babies with or without antenatal diagnosis. However other studies have shown better survival if antenatal diagnosis is made in late gestational period, because of lesser degree of pulmonary hypoplasia and pulmonary hypertension in this group.

This study also shows adverse prognostic factor in neonates with liver and stomach as hernial contents[3].

Other clinical parameters which adversely affected outcome in this study were low Apgar score presence of moderate to severe PPHN and shock[1,2].

Also requirement of high setting in ventilator before surgery, low PaO^2, high $AaDO^2$ (> 500) and high OI > 20 on 1st day of life were found to be significantly associated with mortality.

CONCLUSIONS:

This current study clearly shows that factors causing poor outcome un CDH are low Apgar score, presence of moderate to severe PPHN, need for higher ventilatory settings and shock.

However antenatal diagnosis of CDH failed to have any impact on the outcome and survival rates in our study. Hence from this study we can conclude that an antenatal diagnosis of CDH by itself is not an indication for termination of pregnancy. A protocol based tertiary care of these neonates along with parenteral counselling will improve outcome of this condition.

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