

# Determine the Clinical Characteristics and its Outcomes among Neonates Having Congenital Diaphragmatic Hernia: A Comparison between Survivors and Non-Survivors after surgical treatment

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## ABSTRACT

**Aim:** To examine the clinical characteristics and outcomes in neonates having congenital diaphragmatic hernia.

**Study Design:** Prospective/Observational study.

**Place and Duration:** Department of Paediatric Surgeries, GMMMC Sukkur and Bolan Medical College Hospital Quetta from 1<sup>st</sup> January 2018 to 30<sup>th</sup> June 2018.

**Methods:** In this study we included 24 neonates of both genders who were diagnosed as congenital diaphragmatic hernia by clinical examinations. Patients detailed history including gestational age, mode of delivery and patients age were noted. All patients were underwent surgical treatment of hernia repair.

**Results:** There were 18(75%) male patients and 6 (25%) patients were females. Sixteen (66.67%) neonates were born with C-section mode of delivery while 8(33.33%) were delivered with normal vaginal delivery. Out of 24 patients 20(83.33%) patients had undergone surgical treatment while 4(16.67%) patients had not undergone surgery. In 20 surgical treated patients 18(90%) patients were survived while 2 (10%) neonates were expired after surgery. The mean gestational age of survivors was 35.85±2.56 and non-survivors were 37.23±1.07. We compared survivors with non-survivors and found significant difference in gestational age, persistent pulmonary hypertension in neonates, high frequency oscillatory ventilation and length of hospital stay with P-value <0.05.

**Conclusion:** It is concluded that the surgical treatment of congenital diaphragmatic hernia in neonates had better outcomes and good survival rate.

**Keywords:** Congenital diaphragmatic hernia, Surgical treatment, outcomes. Pulmonary hypertension

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## INTRODUCTION

Worldwide, congenital diaphragmatic hernia (CDH) is the most frequent and important surgical cause of respiratory distress in newborn infants. CDH is usually found in 1 neonate out of 2500 live births.<sup>1</sup> In 1848, congenital diaphragmatic hernia was firstly described by Vincent and in 1946 the first surgical treatment was done by Gross and it was a successful surgery.<sup>2</sup> The most common and important factors that contribute to the highest morbidity and mortality rate are associated pulmonary hypoplasia, persistent pulmonary hypertension, high frequency oscillatory ventilation and long stay at hospital. The rate of survival in CDH diagnosed patient is approx 50% to 60%.<sup>3</sup> However, as per Harrison et al, reported that the correct estimation rate of survival of this congenital disorder is underestimated due to lack of proper knowledge and better surgical procedures to operate the effected neonates<sup>4</sup>.

Congenital diaphragmatic hernia is a complex developmental disorder that involves multiple factors and in 80% no proper cause is identified<sup>5</sup>. Most cases are isolated. Cardiac malformations are the most common association of congenital diaphragmatic hernia and it is rated in 20% of neonates but their etiology is still unclear. In Cornelia de Lange, Pallister-Killian, and Marfan syndrome, complex genetic mutations lead to development of congenital diaphragmatic hernia. Many of researches

reported that there are no specific environmental factors responsible for development of congenital diaphragmatic hernia.<sup>6</sup> Many of case control researches described that the neonates having CDH has low level of retinol<sup>7,8</sup>.

Gestational age and mode of delivery of neonate are the important factors associated with CDH patients. Late term delivery 40 to 41 weeks compared to pre-term delivery <38 weeks has better survival rate and less complications and shorter time of stay at hospital. Surgical treatment of CDH patients shows better survival rate.<sup>9</sup> C-section delivery results in better survival rate as compared to other mode of deliveries if no other anomalies diagnosed in survival<sup>10</sup>.

The purpose of this study was to determine the clinical characteristics and outcome among neonates diagnosed with congenital diaphragmatic hernia. This study may help to reduce the morbidity and mortality associated with this disorder in infants.

## MATERIALS AND METHODS

This study was conducted at Department of Paediatric Surgeries, GMMMC Sukkur and Bolan Medical College Hospital Quetta from 1<sup>st</sup> January 2018 to 30<sup>th</sup> June 2018. Twenty four neonates of both genders who were diagnosed as congenital diaphragmatic hernia by clinical examinations were included. Patients detailed history including gestational age, mode of delivery and patients age were recorded. All patients were candidates for surgical treatment of hernia repair. Patients having congenital diaphragmatic hernia were compared between survivors and non-survivors pre and post-operatively. All

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the statistical data was analyzed by SPSS version 19. P-Value <0.05 was significantly considered.

**RESULTS**

There were 18 (75%) male patients and 6 (25%) patients were females. Sixteen (66.67%) neonates were born with C-section mode of delivery while 8 (33.33%) were delivered with normal vaginal delivery. Out of 24 patients 20 (83.33%) patients had undergone surgical treatment while 4 (16.67%) patients had not undergone surgery and all 4 were expired. In 20 surgically treated patients, 18 (90%) patients were survived while 2 (10%) neonates were expired after surgery (Tables 1-4).

Table 1: Gender-wise distribution of patients

Gender	No.	%
Male	18	75.0
Female	6	25.0

Table 2: Frequency of mode of delivery

Mode of deliver	No.	%
C-section	16	66.67
Normal/Vaginal	8	33.33

Table 3: Survivors and non-survivors pre-operatively

Variable	No.	%
Survivors	20	83.33
Non Survivors	4	16.67

Table 4: Survivors and non-survivors post-operatively

Variable	No.	%
Survivors	18	90
Non Survivors	2	10

Table 5: Comparison among survivors and non-survivors pre-operatively

Variable	Survivors	Expired	P-Value
Mean Gestational Age (weeks)	35.85±2.56	37.23±1.07	0.24
Mean age (hours)	142.62±141.41	16.2±14.24	0.002
<b>Gender</b>			
Male	15 (75%)	3 (75%)	>0.05
Females	5 (25%)	1 (25%)	
<b>Cardiac Malformation</b>			
Found	13 (65%)	3(75%)	>0.05
Not Found	7 (35%)	1(25%)	
<b>Location of DH</b>			
Left	18 (90%)	1 (25%)	>0.05
Right	2 (10%)	3 (75%)	
<b>Persistent pulmonary hypertension</b>			
Found	4 (20%)	2 (50%)	<0.001
Not Found	16 (80%)	2 (50%)	
<b>Pre-operative ventilation</b>			
Received	5 (25%)	4 (100%)	<0.001
Not received	15 (75%)	-	
<b>High frequency oscillatory ventilation</b>			
Received	3 (15%)	1 (25%)	<0.005
Not received	17 (85%)	3(75%)	
Mean length of hospital stay (days)	23.42±3.8	10.46±5.27	<0.001

Pre-operatively mean gestational age of survivors was 35.85±2.56 and non-survivors were 37.23±1.07, mean age of infant on admission among survivors was 142.62±141.41 hours and in non survivors mean age was 16.2±14.24 hours. Cardiac malformation in survivors and non survivors was found in 13 (65%) and 3 (75%) neonates respectively. 18 (90%) patients had left side diaphragmatic hernia in survivors and 1 patient in non-survivors. Persistent pulmonary hypertension found in 4(20%) patients in survivors, 2(50%) in non survivors. 5(25%)

received pre-operative ventilation in survivors while 4 (100%) patients in non survivors. 3(15%) patients received high frequency oscillatory ventilation in survivors and 1 patient in non survivors. The mean length of hospital stay (days) in survivors and non survivors was noted as 23.42±3.8 and 10.46±5.27 (Tables 5-6). We compared survivors with non-survivors and found significant difference in gestational age, persistent pulmonary hypertension in neonates, high frequency oscillatory ventilation and length of hospital stay with P-value <0.05

Table 6: Comparison among survivors and non-survivors post-operatively

Variable	Survivors (n=18)	Expired (n=2)	P-Value
Mean Gestational Age (weeks)	35.85±2.56	38±1	0.24
Mean age (hours)	142.62±141.41	18.3±18.44	0.002
<b>Gender</b>			
Male	14 (77.78%)	1 (50%)	>0.5
Females	4 (22.22%)	1 (50%)	
<b>Cardiac malformation</b>			
Found	15 (83.33%)	2(100%)	>0.5
Not Found	3 (16.67%)	0	
<b>Location of DH</b>			
Left	16 (88.88%)	2 (100%)	>0.05
Right	2 (11.11%)	0	
<b>Persistent pulmonary hypertension</b>			
Found	3 (16.67%)	0	>0.05
Not Found	15 (83.33%)	2(100%)	
<b>Pre-operative ventilation</b>			
Received	4 (22.22%)	2(100%)	>0.5
Not received	14 (77.78%)	0	
<b>High frequency oscillatory ventilation</b>			
Received	2 (11.11%)	1 (50%)	<0.00
Not received	16 (88.88%)	1 (50%)	
Mean length of hospital stay (days)	23.42±3.8	10.56±4.47	<0.00

**DISCUSSION**

Congenital diaphragmatic hernia is one of the most important birth disorders found in neonates. Globally, the rate of mortality is high in newborns affected with congenital diaphragmatic hernia<sup>11</sup>. Most of the infants having congenital diaphragmatic hernia expire before reaching the care centers, it is estimated that only 40% to 50% infants survived after diagnosing congenital diaphragmatic hernia<sup>12</sup>.

In our study, we included 24 patients, who were clinically evaluated and diagnosed as congenital diaphragmatic hernia, were included. Out of all 24 patients (neonates), 18(75%) patients were males and 6(25%) patients were females. These results were similar to the study conducted by Jayalaxmi et al<sup>13</sup> reported that the rate of male patients diagnosed as CDH was high as compared to females. We found that 16(66.67%) neonates were born with C-section mode of delivery while 8(33.33%) were delivered with normal vaginal delivery. Many of studies previously conducted regarding CDH in neonates show that in large number of patients mode of delivery was C-section and they had also better survival rate.<sup>14,15</sup> Our study shows better survival results in patients who were delivered with C-section. The prenatal detection rate for CDH varies enormously in published studies, from 10% to 79%. Most are detected after 24 weeks of gestation<sup>16</sup>.

In our study, out of 24 patients 20(83.33%) patients had undergone surgical treatment while 4(16.67%) patients

had not undergone surgery and all 4 were expired. In 20 surgically treated patients 18(90%) patients were survived while 2(10%) neonates were expired after surgery. These results show that surgical treatment of this disorder gives better results of survival rates. Many of studies regarding CDH in neonates demonstrated that surgical repair of diaphragmatic hernia result in better survival rate and less complications with shorter time of stay in hospital.<sup>17-19</sup> We observed that Pre-operatively mean gestational age of survivors was 35.85±2.56 and non-survivors was 37.23±1.07, mean age of infant on admission among survivors was 142.62±141.41 hours and in non survivors mean age was 16.2±14.24 hours. Cardiac malformation in survivors and non survivors was found in 13(65%) and 3(75%) neonates respectively. 18 (90%) patients had left side diaphragmatic hernia in survivors and 1 patient in non-survivors. Persistent pulmonary hypertension found in 4(20%) patients in survivors, 2(50%) in non survivors. 5 (25%) received pre-operative ventilation in survivors while 4(100%) patients in non survivors. 3(15%) patients had received high frequency oscillatory ventilation in survivors and 1 patient in non survivors. The mean length of hospital stay (days) in survivors and non survivors was noted as 23.42±3.8 and 10.46±5.27. The study conducted by Schaible et al<sup>20</sup>, Tsai et al<sup>21</sup>, Panda et al<sup>22</sup>, Chandraskaran et al<sup>23</sup> and Kadir et al<sup>24</sup> showed similar results to our studies in which PPH, time of stay and mean gestational age found no significant difference. We compared survivors with non-survivors and found significant difference in gestational age, persistent pulmonary hypertension in neonates, high frequency oscillatory ventilation and length of hospital stay with P-value <0.05. These results show similar results to the other study in which there were a significant difference found in PPH, HFOV and length of stay at hospital.<sup>13</sup>

## CONCLUSION

The surgical treatment of congenital diaphragmatic hernia in neonates had better outcomes and good survival rate. Congenital diaphragmatic is commonly found in left side and most of the patients are males. Early surgical treatment and early proper diagnoses may reduce the mortality rate.

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