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Research Article

**PREVALENCE OF HEART DISEASES IN NEONATES  
SUFFERING FROM ASPHYXIA**<sup>1</sup>Dr Nasrullah Achakzai, <sup>2</sup>Dr Maheen Saboor, <sup>1</sup>Dr Aurangzaib Khan<sup>1</sup>Bolan Medical College Quetta<sup>2</sup>Punjab Medical College, Allied Hospital Faisalabad**Abstract:**

**Objectives:** There are many hemodynamic complications present in neonates with asphyxia, there is a need of the proper management and identification of those disorders. This current research work carried out to determine the incidence of the heart abnormalities in the newborns present with asphyxia.

**Methodology:** In this research work, we followed twenty-nine term newborns since their birth until the improvement of the pulmonary hypertension and then we compared the data with the thirty-one neonates with normal birth. We evaluated all the children for their anatomy of heart as well as hemodynamic with very careful evaluation through Echocardiography. This research work was conducted in Bolan Medical Complex Hospital Quetta in the duration from September 2017 to March 2019.

**Results:** The main hemodynamic as well as heart anatomy complications including myocardial dysfunction, pulmonary hypertension and Patent Arterial Duct were present with a positive association with the asphyxia among neonates.

**Conclusion:** There is a strong association of the birth asphyxia with the systolic as well as diastolic dysfunction and pulmonary hypertension which requires absolute assessment, in time identification and proper administration.

**KEYWORDS:** Systolic, Patent Arterial Duct, Echocardiography, Hypertension, Hemodynamic, Anatomy, Myocardial, Pulmonary.

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**INTRODUCTION:**

Asphyxia at the time of birth is the metabolic acidemia because of the reduced transfer of oxygen through placenta or the respiratory tract of the neonates with intra-partum pH of lower than 7.0 and deficit of base higher than 12.0 mmol/l. This problem is the cause of failure of many organs including the encephalopathy of neonates. HIE (Hypoxic Ischemic Encephalopathy) especially when related with the fetal acidosis of pH less than 7.0 and 5<sup>th</sup> minute APGAR (appearance, pulse, grimace, activity, respiratory) scores from 0-3, accounts very serious disorders of organs. The extreme hypoxia cardiovascular abnormalities include regurgitation of the tricuspid valve which is relatively much common, regurgitation of the mitral valve that is not much frequent, pulmonary hypertension and Transient Myocardial Ischemia. But there can be easy ignorance to the cardiovascular abnormalities because there is always more concentration towards the disorders of the end organs.

Various research works tried to demonstrate the significance of the timely identification of the cardiovascular dysfunctions with the utilization of the echocardiography or other associated approaches. This research work aimed to assess the asphyxia among neonates for the indication of the probable prevalence of the cardiovascular complications.

**METHODOLOGY:**

In this research work, we followed twenty-nine term neonates with asphyxia since their birth and then we compared them with the thirty-one well neonates in the ICU of the Bolan Medical Complex Hospital Quetta from September 2017 to March 2019. Among the patients of both groups, we performed the echocardiography on the 1<sup>st</sup> and 2<sup>nd</sup> day of after their birth. We also carried out the follow up echocardiography one time in a week until the development of the pulmonary hypertension or at least once in 30 days. For only two patients, we scheduled the echocardiographic assessment for higher than 30 days because of the prolongation of pulmonary hypertension. We found that all the new births were of

thirty-eight to forty-one gestation age determined by the date of last menses or with the use of ultrasound procedure. We categorized the neonates with the asphyxia into 2 groups of severe and moderate kinds. We excluded the patients suffering from other serious complications of heart. We also omitted the patients present with the diseases of lungs. Patients present with the complications of chromosomes or anomalies of other organs were also not the part of this research work. We used the T test for the comparison of the various continuous variables. We compared the categorical variables with the utilization of Chi-square method. P value of lower than 0.050 was the significant one. SPSS V.20 was in use for the statistical analysis of the collected information. The ethical committee of the institute gave the permission to conduct this research work.

**RESULTS:**

In the group of patients present with asphyxia, 37.90% (n: 11) patients were female and 62.10% (n: 18) patients were males. In comparison with the group of controls, this problem was more frequent in male gender. The common outcome in the neonates with asphyxia was patent arterial duct (62.0%), while only single healthy neonate was present with the patent arterial duct which displays important association between the prevalence of asphyxia with this very complication (Table-1 and Table-2). There is a strong association of the patent arterial duct with the pulmonary hypertension and diastolic anomaly. There was also a positive association of asphyxia with the regurgitation of tricuspid valve (Table-1). Furthermore, the severity of the tricuspid regurgitation was present with a strong correlation with the grade of the pressure gradient. In a consequence, asphyxia among neonates has strong relation with the enhanced pulmonary pressure. Additionally, there was a strong association between pulmonary hypertension and diastolic anomaly. Hereafter, there can a correlation of the pulmonary hypertension with the cardiac hemodynamic.

**Table-I: Comparing Asphyxiated and Healthy Neonates for Cardiovascular Variables**

Characteristic	Category	Asphyxia		Control		P-Value	OR (95% CI)
		No	Percentage	No	Percentage		
Sex	Male	18.0	62.10	13.0	41.90	0.1000	
	Female	11.0	37.90	18.0	58.10		
Patent duct arterial Tricuspid Dysfunction	Yes	18.0	94.70	1.0	5.30	<0.0010	0.020 (0.0020-0.010)
	No	11.0	26.80	30.0	73.20		
Regurgitation Mitral	Yes	29.0	64.40	16.0	35.60	0.0030	0.170 (0.050-0.590)
	No	0.0	0.00	15.0	100.00		
Regurgitation Pulmonary	Yes	3.0	10.00	0.0	0.00	0.0600	
	No	26.0	90.00	31.0	54.40		
Hypertension Systolic	Yes	20.0	76.90	6.0	23.10	<0.0010	0.10 (0.030-0.350)
	No	9.0	26.50	25.0	73.50		
Dysfunction Diastolic	Yes	9.0	100.00	0.0	0.00	<0.0010	0.390 (0.270-0.550)
	No	20.0	39.20	31.0	60.80		
Dysfunction	Yes	15.0	100.00	0.0	0.00	<0.0010	0.310 (0.200-0.480)
	No	14.0	31.10	31.0	68.90		

The regurgitation of the mitral valve was not common in the neonates with asphyxia; but we found the moderate regurgitation in only single patient suffering from moderate asphyxia and in 2 other patients suffering from severe asphyxia (Table-1). About 1/3<sup>rd</sup> neonates with asphyxia were present with different grades of systolic anomalies. Statistical evaluation showed the strong association between the systolic anomaly and the asphyxia's severity (Tables-1 and Table-2). We detected the diastolic dysfunction half proportion of the neonates with asphyxia (Table-1). Similarly, there was a strong association of diastolic dysfunction with the pulmonary hypertension, tricuspid regurgitation and patent arterial duct.

**Table-II: Comparison of Heart Complication in Three Groups of Newborns**

Characteristic	Category	Asphyxia		Control		P Value	OR (95% CI)
		No	Percentage	No	Percentage		
Patent duct arterial	No	11.0	26.80	30.0	73.20	-	-
	Small	6.0	100.00	0.0	0.00	<0.0010	1.540 (1.090 - 2.200)
Tricuspid	Moderate to Large	12.0	92.30	1.0	7.70	<0.0010	32.430 (3.800 - 282.030)
	No	0.0	0.00	15.0	100.00	-	-
	Mild	26.0	-	14.0	-	0.3600	1.070 (0.940 - 1.230)
Regurgitation	Moderate to Severe	3.0	-	2.0	-	0.0050	5.200 (1.550 - 17.440)
	No	20.0	39.20	31.0	60.80	-	-
Systolic Dysfunction	Moderate	6.0	-	0.0	0.00	0.0050	1.30 (1.050 - 1.600)
	Severe	3.0	-	0.0	0.00	0.0390	1.150 (0.980 - 1.350)
Diastolic	No	14.0	31.10	31.0	68.90	-	1.500 (1.110 - 2.030)
	Moderate	8.0	-	0.0	0.00	0.0010	
Dysfunction	Severe	7.0	-	0.0	0.00	<0.0010	1.570 (1.150 - 2.150)

We detected the pulmonary hypertension in 2/3<sup>rd</sup> neonates suffering from asphyxia. All the patients of this research work in sever state were various levels of pulmonary hypertension, while the presence of pulmonary hypertension was 57.0% in the patients present with moderate asphyxia. There was a strong association of the enhanced pulmonary hypertension and asphyxia (Table-1). We did not detect any association of weight with the other variables of the study.

There was abnormal Antero posterior chest X-ray in the neonates with asphyxia especially those patients present in severe state.

### DISCUSSION:

In this current research work, we put our effort to assess the cardiovascular problems after birth asphyxia particularly by the precise echocardiographic evaluation. Diastolic anomaly was available in more than half patients, whether they were in severe or moderate state of the disease. There was high occurrence of diastolic dysfunction in the patients suffering from severe asphyxia. There was also a strong effect of asphyxia on the systolic dysfunction. Asphyxia's degree determines the seriousness of the cardiac dysfunction but we can ignore it in case of mild hypoxia. Transitory Myocardial Ischemia is mostly the complication in case of asphyxia of severe nature and its range can be from tachypnea to the cardiogenic shock. Myocardial dysfunction can be the outcome of the severe asphyxia. Tenacious low cardiac output in the duration of first two days of life of neonates with the presence of the perinatal asphyxia has association with the high rate of mortality.

Asphyxia could also have the worst outcomes on the heart of neonates, however, oxidative impact of the re-oxygenation can be the reason of the severe cardiovascular outcomes with high rate of morbidity as well as mortality which is because of the degradation of cardiac Myosin Light Chain-1 by the Matrix Metalloproteinase-2.

However, the occurrence of the hypoxia after the birth asphyxia is very acknowledges reason of the cardiac anomalies.

Some other reasons like pulmonary hypertension and patent arterial duct can play an important part. We also detected the significant association among the diastolic anomaly and both patent arterial duct as well as pulmonary hypertension. The most common finding after the birth asphyxia is the patent arterial duct as elaborated by this research work (62.0%). We study its mechanism on the asphyxiated lambs. The patent arterial duct particularly with medium of high size can be another feature for pulmonary hypertension or cardiac anomalies as presented in this very research work.

The regurgitation of the tricuspid valve was the other visible outcome after the birth asphyxia, other research works also reported this finding. Principally, it was present with the relation to the pulmonary hypertension and diastolic anomaly. The other reason of the regurgitation of the tricuspid valve in the

neonates with asphyxia can be papillary muscle ischemia particularly in the patients suffering from diseases of coronary artery in their adult age. The pulmonary hypertension among newborns can play a vital role in the development of the dysfunction of left or right ventricular with their remodeling through decreased cardiolipin biosynthesis and remodeling enzymes.

### CONCLUSIONS:

Asphyxia among neonates is the reason behind different cardio-vascular complications as myocardial dysfunction and the transient pulmonary Hypertension. These types of hemodynamic anomalies are the actual dangers for the newborns. So, there is need of more attention and in time identification for proper and timely administration of the issue. Echocardiographic assessment is much necessary.

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