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ORIGINAL RESEARCH

Clinical profile of congenital heart disease in neonates

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Abstract
Background: "Congenital heart disease defined as an abnormality in cardio circulatory structure or function that is mostly present at birth, even it is discovered much later. The incidences of moderate to severe structural congenital heart disease in live born infant is 6 to 8 per 1000 live births. 5-8 Accordingly, the congenital heart disease are not fixed anatomic defects that appear at birth, but are instead a dynamic group of anomalies that originates in fetal life and changes considerable during the postnatal development.
Aims and Objective: To evaluate clinical profile of various CHDs identified during newborn period.
Material and method: The study was conducted in Dhiraj hospital, Department of Pediatrics and Neonatology. Total 73 cases diagnosed CHD by Echocardiography in neonatal period were studied. Study period: February 2021 to July 2022(1.5 year span). All babies of CHD were subjected to detailed clinical history and through clinical examination which included cardiac examination and other relevant systemic examination as well as co morbid conditions. Echocardiography findings were noted in details. Details regarding all neonates having CHD were noted in the prescribed Performa. Hospitalized neonates were reviewed daily till discharge and then on follow up basis up to 3 months of age. Outcome was recorded as discharged, leave against medical advice, transfer to other facilities, and expired.Follow -up was done up to 3 months of age during which infant was examined in detail ,complaints if any were assessed , anthropometry was noted and a 2dEcho was done .
Results and Conclusion: Out of total 73 babies; 59(80.82%) were Acyanotic type of CHD while 14(19.17%) were Cyanotic type of CHD.Amongst 59 Acyanotic CHD cases; commonest was ASD in 20 (27.4%), followed by PDA in 19 (26.02%), VSD in 7(9.58%) . Amongst Cyanotic 14(19.17%) cases, maximum incidence was of TGA 4 (5.47%) cases; followed by TAPVC and COMPLEX CHD in 2 (2.73%). The majority of newborns with CHD (75.23%) were LBW. Among newborns with CHD, 48.4% were preterm.CHD was diagnosed ≤ 7 days of life in 83.5% and 16.39% in >7 days of life. Neonates with associated co morbid condition were 60(82.1%) and 13(17%) were without any associated co morbid condition. Primary complain of most the babies was breathing difficulty (75.34%) followed by feeding difficulty(45.8%). The most common presenting sign was murmur (91.78%) followed by tachycardia (54.79%), tachypnea(56.16%), chest retraction (44.28%), bounding pulse (15.27%), weak pulse (6.94%), cyanosis (19.44%), hypotension (9.72%). Among chest radiographic profile maximum presentation was with cardiomegaly in 18(24.65%) followed by Lung opacity 7(9.58%) and pulmonary plethora in 6(8.22). Among 7 (9.58%) expired babies, none had cyanotic CHD while 7(9.58%) had Acyanotic CHD. In all acyanotic type CHD, cardiac defect was a contributing factor for their death rather than primary cause of death. Out of 73 cases of CHD ,45(61.64%) came for regular follow up out of which 27(60 %) had absolutely normal echo on follow up while other 18(40 %)had abnormalities Out of 45 follow- up,23.2% of children suffered from respiratory tract infection and 9.5% had complain of not gaining weight, while 40% children thrived well. Key words: Congenital heart disease, Cyanotic, Acyanotic, Neonates

Introduction

Heart defects are among the most common birth defect, occurring in 1% of live births A congenital heart defect (CHD), also known as a congenital heart anomaly, is a defect in the structure of the heart or great vessels that is present at birth.2Heart defects are divided into two main groups: cyanotic heart defects and acyanotic heart defects. The incidence of moderate to severe structural congenital heart disease in live born infant is 6 to 8 per 1000 live birth.5-8 .This incidence is relatively constant over years and indifferent parts of world 13More recently higher incidence appears to be due to inclusion of more trivial forms of congenital heart disease , such as tiny ventricular septal defects that are detected more frequently by higher sensitive echocardiography.6 Congenital cardiac defects have a wide spectrum of severity in infants. Above 2-3 per 1000 newborn will be symptomatic with heart disease in 1st year of life. The diagnosis is established by week of age in 40-50% of patients. With advance in both palliative and corrective surgery in last 20 years, the number of children with congenital heart disease surviving to adulthood has increased dramatically.9 The timing of presentations and accompanying symptomatology depending

upon the (1) nature and severity of anatomic defects (2) the in utero effects of the structural Introduction 2 lesions and (3) the alteration in cardiovascular physiology secondary to the effects of transitional circulation e.g. closure of the ductus arteriosus and the fall in the pulmonary vascular resistance.6 Most congenital defects are well tolerated in the fetus because of the parallel nature of fetal circulation. Even the severe cardiac defects (Hypo plastic left heart syndrome) can usually, be well compensated by the fetal circulation. It is only after the when the fetal pathways are closed that the fully hemodynamic impact of an abnormality becomes apparent.9 Although the most significant transitions in circulation occur in the immediate perinatal period, the circulation continue to undergo changes after birth, and these later changes may also have hemodynamic impact on cardiac lesions and their apparent incidence. As pulmonary vascular resistance falls over the first several weeks of life , left to right shunting through intra cardiac defects increases and symptom becomes more apparent. Thus in patient with a ventricular septal defect, heart failure is often manifested between 1 and 3 months of age. The severity of various septal defects can also change dramatically with growth; some VSDs may become smaller and even close as the child ages. Alternatively, stenosis of the aortic or pulmonary valve, which may be mild in newborn period, may become worse if valve orifice growth does not keep pace with patient's growth.9 Depending upon the severity, CHD presenting at birth can be categorized into 3 groups – mild, moderate, severe CHD includes all cyanotic lesions as well as acyanotic lesions (Large VSD, Large PDA, Critical AS, Critical PS, Critical Coarctation and AVSD) which require intervention early in life.10 Introduction 3 Moderate CHD Mild-Moderate AS or PS, Non critical coarctation, Large ASD) are those that require expert care, but less intensive compared to severe CHD, Mild CHD, (Small VSD, PDA, ASD, Mild AS or PS) are asymptomatic and often undergo spontaneous resolution.10 The initial evaluation of any newborn suspected of having critical congenital heart disease include a thorough physical exam, four extremity blood pressure, preductal and postductal saturations, a chest radiograph and echocardiography. The recognition of congenital heart disease in newborn is important as these group abnormalities consitiutes a significant proportion of congenital malformation that present in neonatal life, their early detection is important for appropriate management , and short term follow up for decision making regarding referral or waiting. In our country that is so vast, reaching up to each and every corner and searching for cases is a very difficult task even the government schemes are working efficiently but still cases in rural areas get unnoticed, also much of the times after the cases are detected there is problem with set up, financial issues, infrastructure, management is not proper these all leads to increase in mortality rate and patient suffering

Methodology

It is a prospective study where in intramural and extramural neonates suspected with congenital heart disease will be studied. All the data will be recorded with respect to age, sex, birth weight, gestational age, detailed history of presenting complain, any feeding difficulty, breathing difficulty, cyanosis, significant maternal antenatal history, family history, consanguinity will be taken as per performa designed for the study. This will be followed by detailed physical and general examination including cardiovascular assessment and relevant findings in other system and associated co morbid conditions, associated extra cardiac anomalies and associated syndrome will be recorded. Relevant investigation like all CXR, four limbs Spo2, Blood pressure and Echocardiography will be done. Echocardiography examination will be done by paediatric cardiologist Echocardiography will be done , if there are any indicator for underlying CHD –like presence of murmur (systolic murmur of grade 2 or more or any diastolic murmur), CCF, cyanosis, loud P2, abnormal CXR, failed hyperoxia test, abnormal pulse oximetry neonatal screening, increasing and prolonged need of ventilator support. Details regarding all neonates having CHD will be noted in prescribed performa. Severity of the congenital heart disease and management will be assessed and those survived will be followed up every monthly till 3months of age.

Objectives of the study

- To find the incidence of congenital heart disease in neonates
- To study the Clinical presentation in CHD in neonates.
- To study the short term outcome in neonates with CHD

Inclusion Criteria

- All neonates (age from birth to 28 days) born in the DGH or reported to DGH with congenital heart disease
- All neonates diagnosed by Echocardiography.
- Parents are willing to give consent.

Exclusion Criteria

- Age more than 28 days at the time of diagnosis
- Babies of parents who refused to sign the consent form were excluded from the study

Results

This study was conducted in Dhiraj Hospital department of Paediatrics Neonatology, total 73 cases of cases of CHD diagnosed by Echocardiography in neonatal period during the study period (1.5 year from Februrary2021 to July 2022) are included in this study.

Incidence

Table No.1: Frequency of Congenital Heart Disease among Hospital live birth

Subject	Inborn	Outborn
Total Live birth	4036	--
NICU Admissions	658	362
Neonates with CHD	47	26

Incidence of CHD among neonates born at Dhiraj hospital was 11.69 per 1000 live birth (47 out of 4036 live birth) CHD was found in 7.15 % of NICU admitted neonates (73 cases out of total 1020 NICU admissions)

Sample profile

Sex distribution

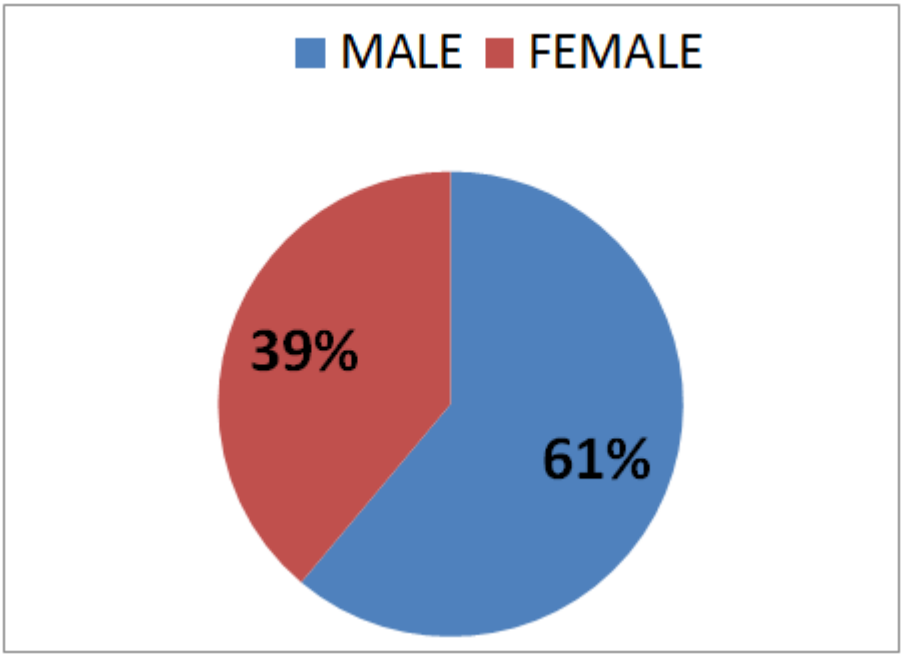
Out of 73 patients, 28(38%) were females and 45(61%) were males. Thus male: female ratio was 1.57:1.

Table No.2: Distribution by Gesatational Age

SEX	No. of cases	Percentage
Male	45	61%
Female	28	39%

This table shows the sex distribution 61.0% were male and 39.0% were female.

Figure 1 : Distribution Of CHD By Gender



Birth weight

The birth weight of babies in this study range from 700 gm to 3800 gm .Their weight distribution shown in the following table.

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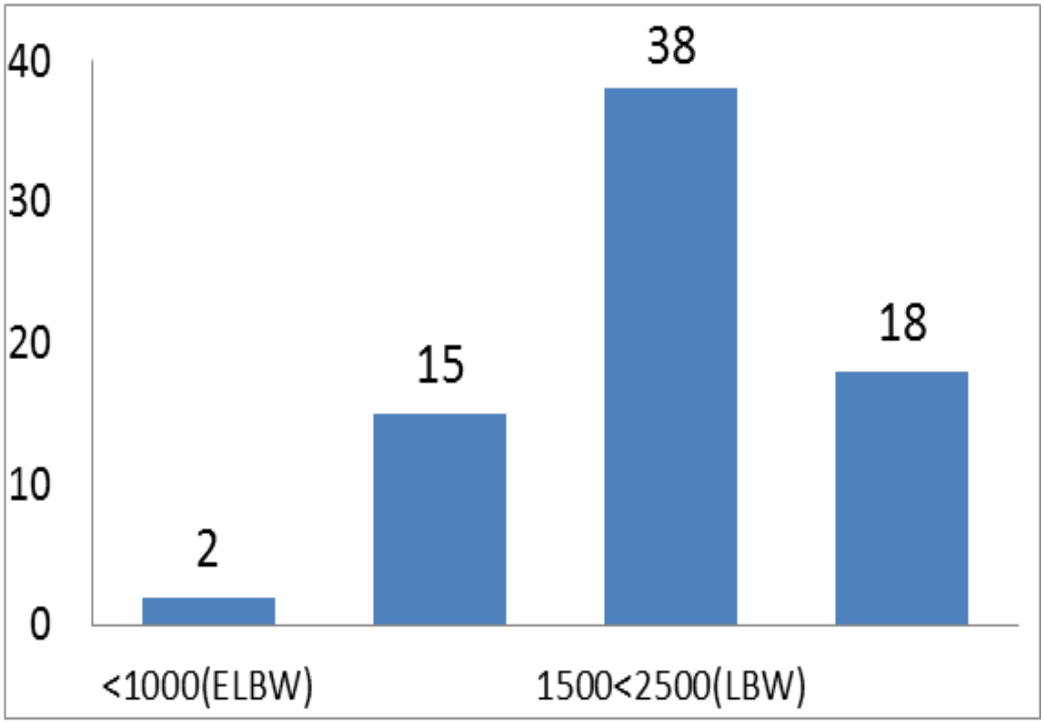
Table-3: Distribution of CHD by birth weight

Birth weight (Gm)	No. of cases	Percentages
< 1000 (ELBW)	2	2.73%
1000 < 1500 (VLBW)	15	20.5%
1500 < 2500 (LBW)	38	52%
≥ 2500	18	24.6%

Figure 2: Distribution Of CHD By Birth Weight



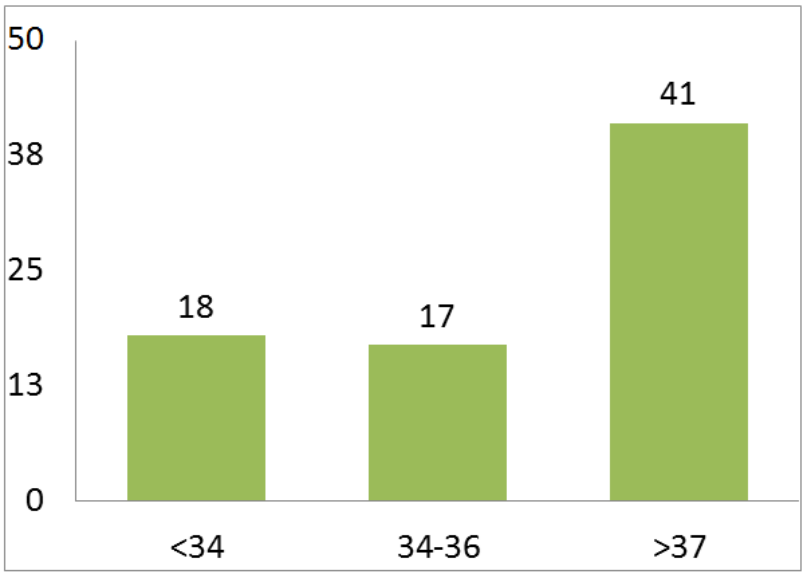
Gestation Age (In Weeks)

The babies ranged from 28 to 40 weeks and their distribution is as follows: Out of 32 babies 18(24.6%) were <34 week, 17(23.8%) babies were between 34 to 36 week and 41(56.1%) were >37 week of life.

Table 4: Distribution of CHD by gestational age

Gestational age (weeks)	No. of patients	Percentage
< 34	18	24.6%
34–36wks 6 days	17	23.8%
≥ 37	41	56.1%

Figure : 3 Distribution Of CHD by Gestational Age



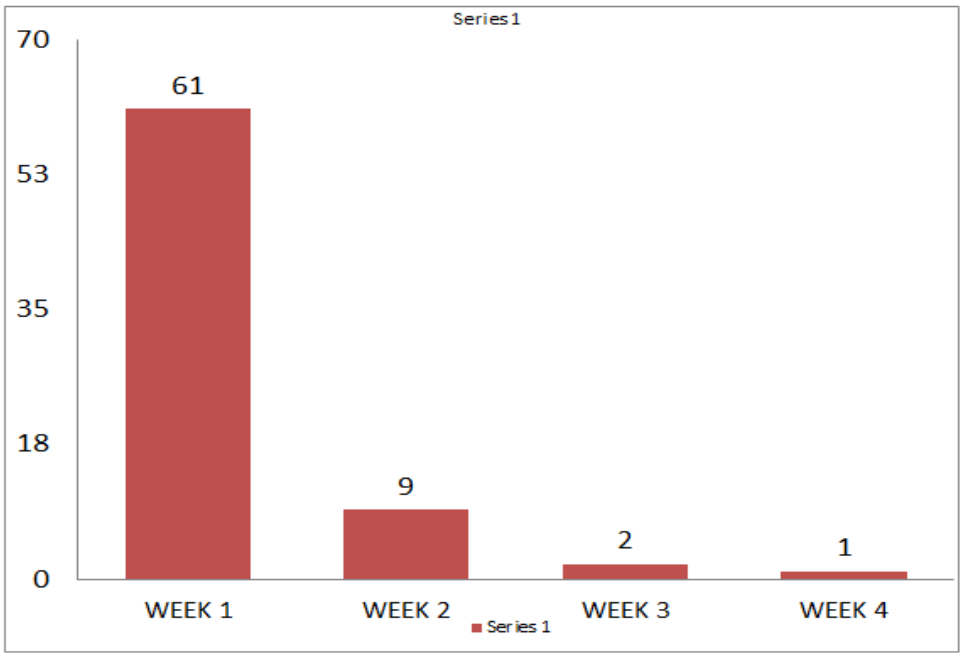
Age at the time of diagnosis CHD

Out of 73 babies, 60(83.5%) were diagnosed before completing 7th day of life

Table 5: Age at the time of diagnosis CHD

DOL	N	%
week 1(1-7 days)	61	83.5%
week 2(8-14 days)	9	12.3%
week 3(15-21 days)	2	2.73%
week 4 (22-28 days)	1	1.36%
Total	73	

Figure 4: Age at the time of presentation



Antenatal and family history

Out of 73 babies, 15(20.54%) mother had significant antenatal history. Out of which, 2(2.73%) mothers had fever without rash, 4(5.45%)mothers suffered from diabetes mellitus, 3(4.16%) suffered from hypertension.,2(2.73%) mother had hypothyroidism,1(1.36%) mother was covid positive,1(1.36%) mother had h/o uterine abnormalities and had in-vitro fertilisation 1(1.36%) of sibling was reportedly affected from congenital heart disease.

Associated anomalies and syndromes

Out of 73 babies 9(12.3%) babies had associated anomalies out of which 2(2.73%) babies had organ deformity, 2(2.73%) had skeletal deformity , 2(2.73%) had limb deformity, 1(1.36%) had cleft lip with palate. 8(10.95%) had features of facial abnormalities..

Table -6: Distribution of anomalies with CHD

	No. of cases	Percentage
With Anomalies	10	13.6%
Without Anomalies	63	86.3%
Total	73	

Table - 7: Associated anomalies and syndromes distribution

Associated anomalies and syndromes	Frequency(N)	%
Skeletal deformity	2	2.73%
Facial abnormalities	8	10.95%
Limb deformity	2	2.73%
Organ deformity	2	2.73%
Cleft lip	1	1.36%

Clinical profile

Presenting complaints: Primary complain of most the babies was breathing difficulty (75.34%) followed by feeding difficulty(45.8%) and cyanosis (6.94%) and (22.2%) babies was asymptomatic.

Table -8: Distribution of CHD by Presenting symptoms

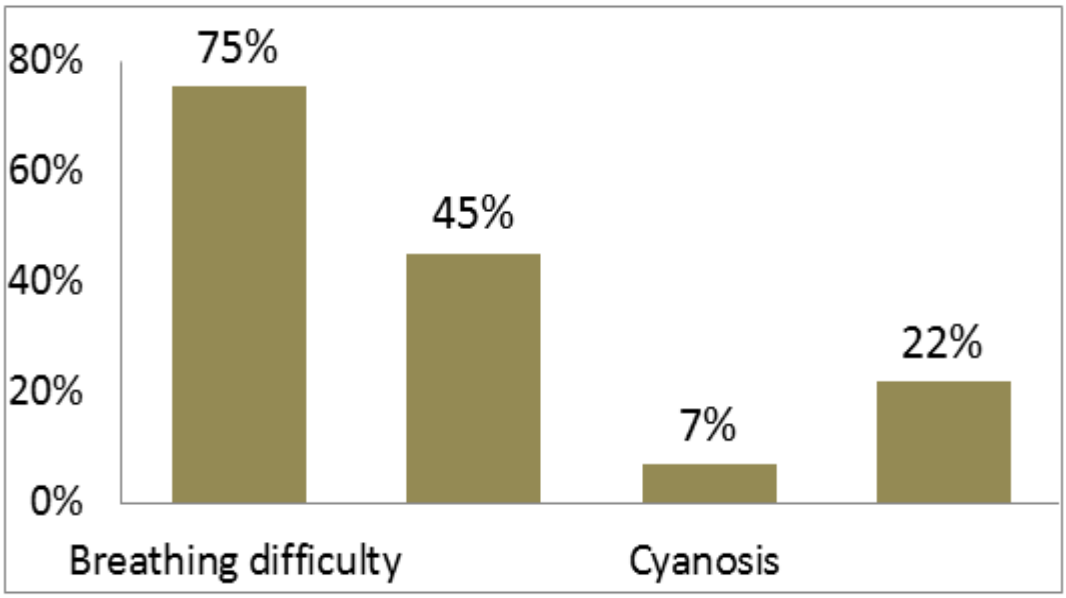
Chief Complaints	Frequency (N=73)	%
Breathing difficulty	55	75.34%
Feeding difficulty	33	45.20%
Cyanosis	5	6.84%
Asymptomatic	16	21.9%

Figure 5: Distribution of CHD by presenting symptoms

Presenting signs

The most common presenting sign was murmur (91.78%) followed by tachycardia (54.79%), tachypnea(56.16%), chest retraction (44.28%), bounding pulse (15.27%), weak pulse (6.94%), cyanosis (19.44%), hypotension (9.72%).

Figure 6: Distribution of CHD by presenting signs



Associated co morbid condition

There were 73 cases of CHD, out of which 46 cases were of inborn while 27 were outborn. Neonates with associated co morbid condition were 60(82.1%) and 13(17%) were without any associated co morbid condition.

Table –7: Distribution of co morbid conditions with CHD

	No of cases	Percentage
Associated with co morbid condition	60	82.1%
Not Associated with co morbid condition	13	17%

Figure 7: Distribution of CHD by co morbid conditions

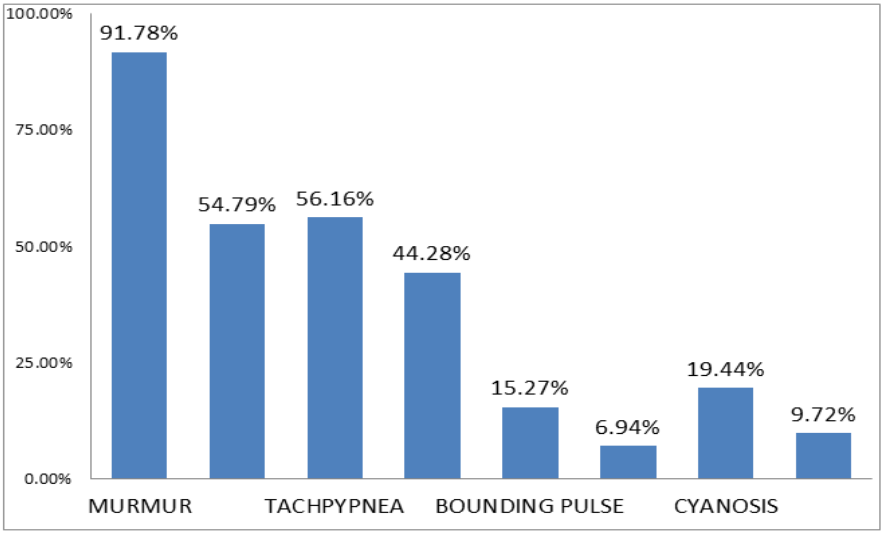


Table-8: List of co morbid condition distribution in inborn and outborn babies

Associated co-morbid condition	Inborn (frequency) (Out of 47)	%	Outborn (frequency) (out of 26)	%
Sepsis	14	29.78%	10	38.46%
Pneumonia	4	8.51%	7	26.92%
Birth asphyxia	5	10.63%	2	7.69%
Prematurity(<34 week)	6	12.76%	11	42.30%
RDS	9	19.14%	4	15.38%
TTN	7	14.89%	1	3.84%
MAS	2	4.25%	1	3.84%
Apnea of prematurity	2	4.25%	1	3.84%
ARF	0	0.0%	1	3.84%
Covid positive IgG	4	8.51%	2	7.69%
Tracheo-esophageal fistula	4	8.51%	2	7.69%
Encephalocele	0	0.0%	0	0.0%

From the above table we concluded that, in Inborn(47) most common associated co morbid condition were sepsis 14(29.78%),RDS 9(19.14%) followed by TTN in 7(14.89%) and prematurity in 6(12.76%).While in outborn(26) babies, most common associated co morbid condition were prematurity in 11(42.30%), sepsis in 10(38.46%), pneumonia in 7(26.92%), RDS in 4(15.38%).

Investigations

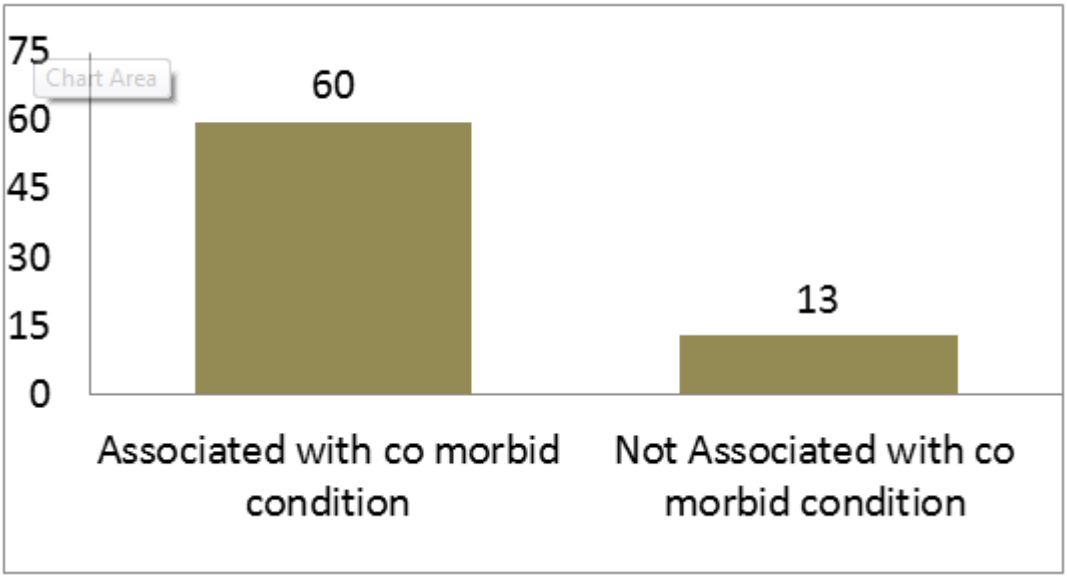
Chest radiograph

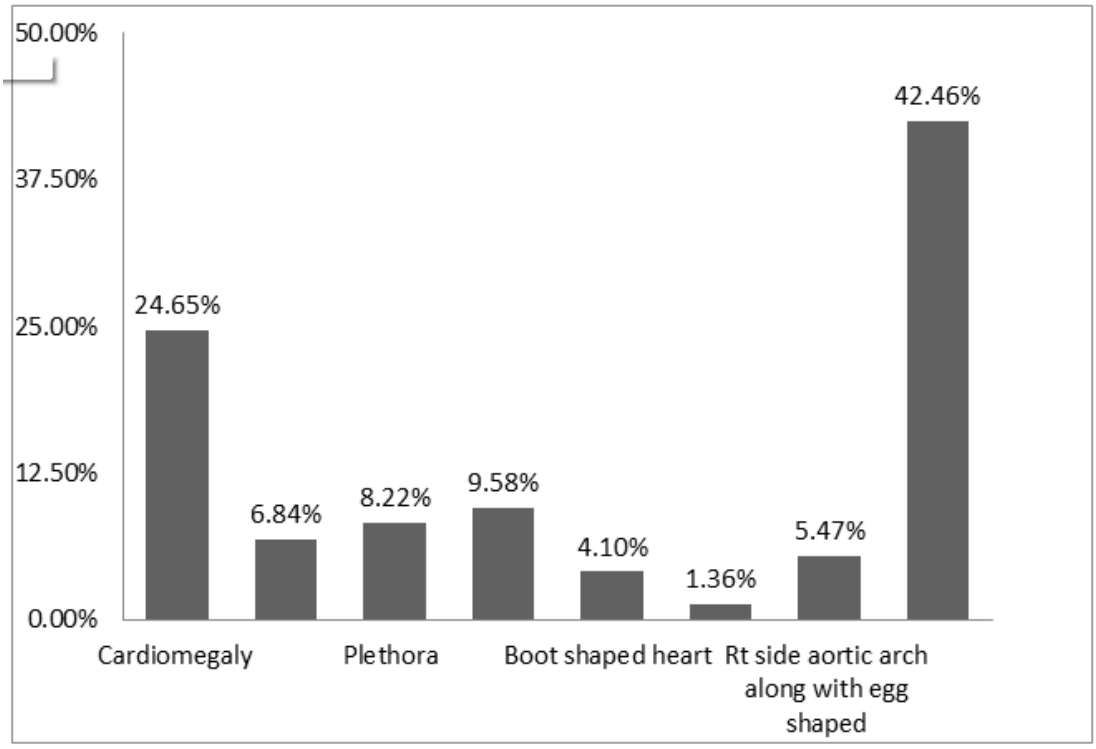
Out of 73 babies with CHD; 31(42.46%) were normal and rest 42(57.53%) had abnormal chest x ray findings. Amongst 42(57.53%) cases of Abnormal chest x ray, maximum presentation was with cardiomegaly in 18(24.65%) followed by Lung opacity 7(9.58%),pulmonary plethora in 6(8.22%), pulmonary oligemia in 5(6.84%) , right side aortic arch and egg shaped heart in 4(5.47%) ,boot shaped heart in 3(4.10%)and pleural effusion 1(1.36%).

Table 9: Distribution of CHD by chest X ray finding

Chest X Ray Findings	N (n =73)	%
Cardiomegaly	18	24.65%
Rt side aortic arch along with egg shaped	4	5.47%
Oligemia	5	6.84%
Plethora	6	8.22%
Lung opacity	7	9.58%
Boot shaped heart	3	4.10%
Pleural effusion	1	1.36%
Normal	31	42.46%

Figure 6: Distribution of CHD by Chest x ray findings





Echocardiography

Out of 73 babies 59(80.82%) were having Acyanotic CHD and 14(19.44%) had Cyanotic CHD.

Table 10: Type of CHD

CHD	No of cases	%
Cyanotic	14	19.17%
Acyanotic	59	80.82%
Total	73	100.00%

Figure 7: Type of CHD

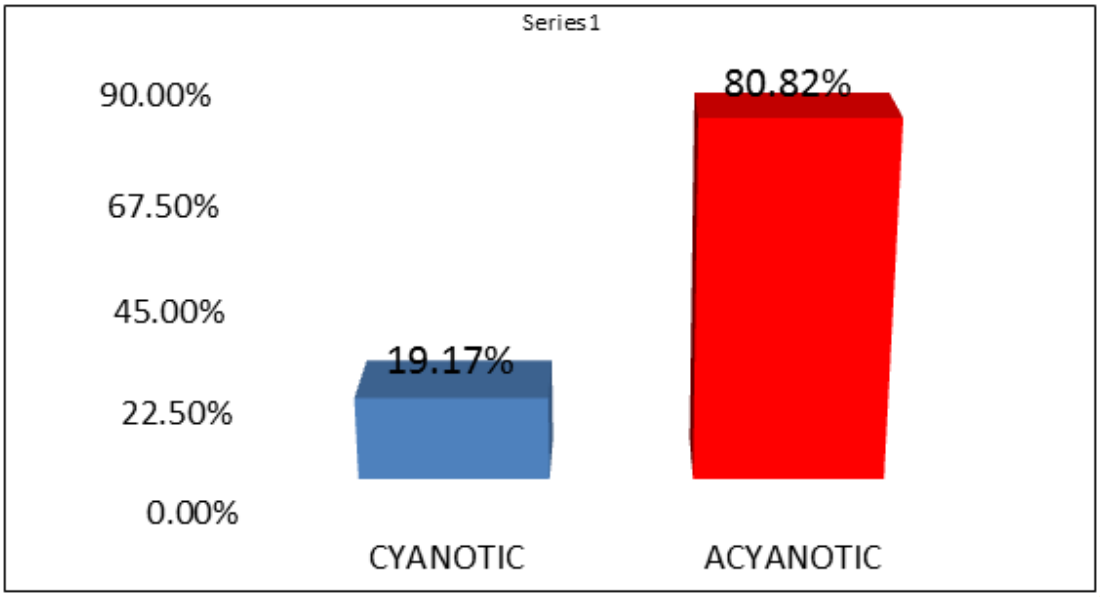


Table -11: Distribution of CHD by Echocardiography findings (N = 73)

ECHOCARDIOGRAPHY			
TYPE OF CHD		**N**	**%**
Acyanotic CHD	ASD	20	27.39%
	ASD+PDA	4	5.47%
	ASD+VSD	5	6.84%
	ASD+VSD+PDA	1	1.36%
	PDA	20	27.39%
	VSD	7	9.58%
	VSD+PDA	2	2.73%
	Total	**59**	**80.82%**
Cyanotic CHD	COMPLETE AV CANAL DEFECT+PDA	1	1.36%
	COMPLEX CHD	2	2.73%
	TAPVC	2	2.73%
	ASD+VSD	1	1.36%
	ASD+VSD+PDA	1	1.36%
	TOF+PS	2	2.73%
	TGA	4	5.47%
	TOF+ASD	1	1.36%
	Total	**14**	**19.17%**

Treatment given

Out of 73 babies 33(45.20%) received Inotropes, 47(64.38%) received oxygen, 31(42.46%) were ventilated, 1(1.36%) received Furosemide, 1 (1.36%) received digoxin, 13(17.80%) received paracetamol.

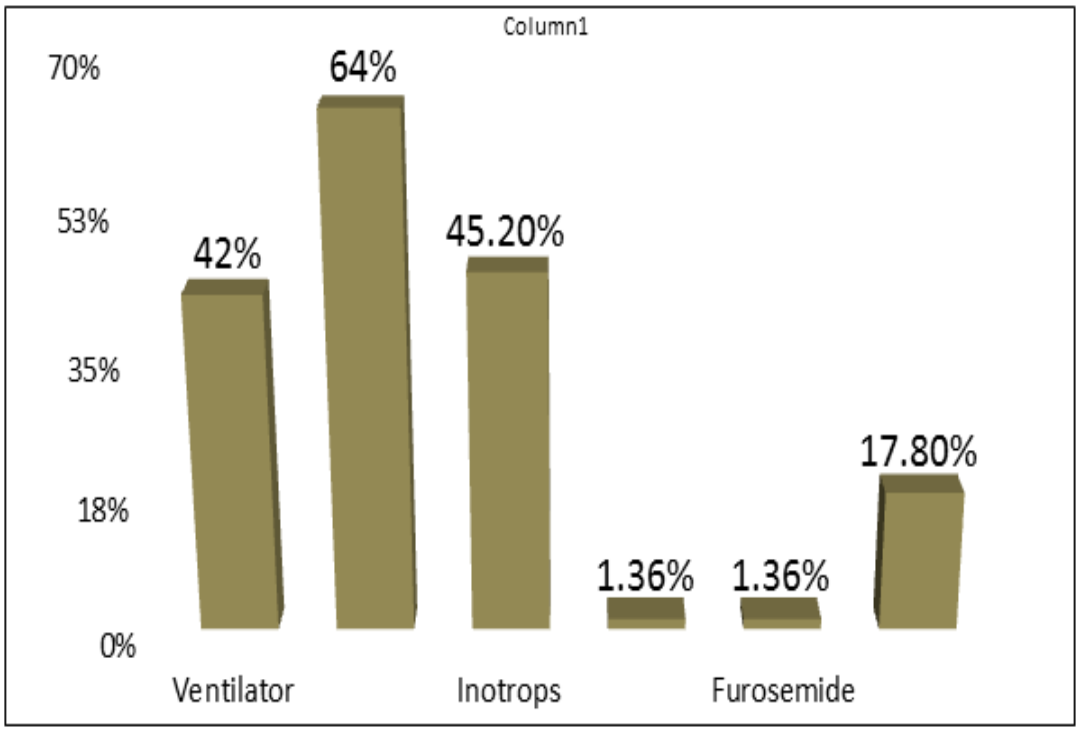
Table 12: Treatment given

Treatment	N	%
Ventilator	31	42.46%
Oxygen	47	64.38%
Inotrope	33	45.20%
Digoxin	1	1.36%
Furosemide	1	1.36%
Paracetamol	13	17.80%

Table 14: Treatment distribution

TYPE OF CHD		Ventilator	Inotrops	oxygen	Furosemide	Digoxin	Pcm
Acyanotic CHD	ASD	7	7	14	0	0	0
	ASD+VSD	1	2	1	0	0	0
	ASD+VSD+PDA	0	0	0	0	0	0
	PDA	5	6	13	0	0	13
	VSD	2	3	4	0	0	0
	VSD+PDA	0	1	0	0	0	0
	Total	**15**	**20**	**31**	**0**	**0**	**13**
Cyanotic CHD	COMPLETE AV CANAL DEFECT	1	1	1	0	0	0
	COMPLEX CHD	1	1	1	0	0	0
	TAPVC	2	2	2	0	1	0
	ASD+VSD+PDA	2	2	2	1	1	0
	TGA	4	4	4	0	0	0
	TOF+PS	3	3	3	0	0	0
	Total	**13**	**13**	**13**	**1**	**2**	**0**

Figure 9: Distribution of Treatment



Outcome

Out of 73 babies 50(68.49%) were discharged, 4(5.47%) went left against medical advice (LAMA), 12(16.43%) were referred to higher centre for surgery and 7(9.58%) babies expired.

Table 15: Outcome distribution

Outcome	N	%
LAMA	4	5.47%
DISCHARGE	50	68.49%
EXPIRED	7	9.58%
REFERRED FOR SURGERY	12	16.43%
TOTAL	73	100.0

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Figure 10: Distribution of CHD by Outcome

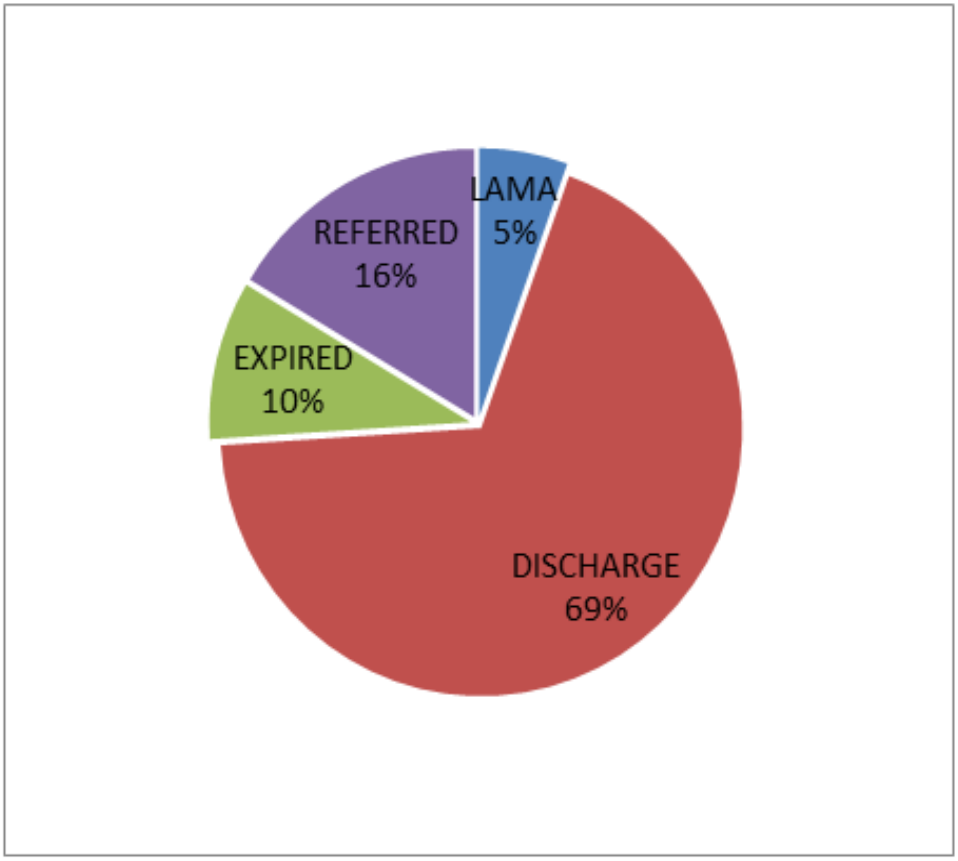

Table 16- Outcome of Follow - up

OUTCOME	N	PERCENTAGE
REGULAR FOLLOW-UP	45	61.64%
LOST TO FOLLOW-UP	15	20.54%
DEATH	13	17.80%

Table 17 - 2D ECHO on follow - up

SR.NO.	2D ECHO DURING ADMISSION	2D ECHO ON FOLLOW UP
1	ASD	ASD
2	ASD+VSD+PDA	ASD+VSD
3	ASD	ASD
4	ASD	ASD
5	VSD	VSD
6	VSD+ASD+PDA	ASD+VSD
7	ASD	ASD
8	ASD	ASD
9	TOF+PS	TOF
10	ASD	ASD

11	VSD	VSD
12	VSD	VSD
13	ASD+VSD	VSD
14	ASD	ASD
15	ASD+VSD+PS	VSD
16	VSD	VSD
17	PDA+ASD	PDA
18	PDA	PDA

Out of 73 cases of CHD, 45(61.64%) came for regular follow up out of which 27(60 %) had absolutely normal echo on follow up while other 18(40 %) had abnormalities. Other 15(20.54 %) lost to follow up while rest 13(17.80 %) were expired.

Table 18 - Follow up of the CHD neonates and their complaints.

Complaints	No .of cases (n)	(%)
RTI (Respiratory tract infections)	17	23.2
Not Gaining Weight	7	9.5
Normal	27	40

Out of 45 follow- up, 23.2% of children suffered from respiratory tract infection and 9.5% had complain of not gaining weight, while 40% children thrived well.

Discussion

Congenital heart disease is described as a defect in the structure or function of the cardio-circulatory system that is typically present from birth, even if it is only detected long later. [1,2,3,4]

Infants with congenital heart abnormalities range widely in terms of severity.

The 73 neonates who were hospitalised to the NICU at Dhiraj Hospital and diagnosed with CHD by echocardiography—47 inborn and 26 outborn—were the subjects of the current study.

In present study, out of 4036 admitted live birth neonates, 47 were diagnosed with CHD in Dhiraj hospital. Incidence of CHD among neonates born at Dhiraj hospital was 11.69 per 1000 live birth which is similar to various national and international studies.

	Amroliwala et al.[5]	**MB Ali et al[6]**	**Khalil A et al[7]**	**Shah GS, et al.[8]**	**Islam MN et al[9]**
Incidence per live birth	7-8/1000	4-5/1000	5-10/1000	6-7/1000	7-8/1000

Sex distribution

In the present study, the Male to Female ratio was 1.57:1

In Nepal, similar study by **Shah GS, et al.[8]** showed male to female ratio of 1.5:1 ,

In study of **Amroliwala et al.[5]** the Male to Female ratio was 1.38:1.

In Hyderabad, similar study by **Ravilala,et al.[10]** showed male to female ratio of 1.1:1 and

In Pakistan, study by **Humuayun KN et al.[11]** showed male to female ratio was 1.7:1.

Another study by **Farooqui R et al.[12]** showed male to female ratio was 1.6:1. Finding of both studies was similar to present study.

In Jammu and Kashmir study done by **Mir et al.[13]** with male to female ratio 1.12:1.

Birth weight and gestational age distribution

In present study, 75.34% cases of CHD constituted by low birth weight and 47.9% were found to be of preterm. About 83.5% of our cases were admitted in early neonatal period <7 days.

Study by **Humayun KN et al.[11]** reported that 31% babies were low birth weight and 69% were appropriate for gestational age.

Associated with extra cardiac anomalies and syndromes

In the present study extra cardiac malformation were found in 13.6% patient as compare with the reported studies of 16-26% of cases with CHD.[63]

	Molaei A et al [14]	Kasturi A et al[15]	Khalil et al.[7]	Amroliwala et al.[5]	Islam MN et al.[9]	Present study
Extra cardiac anomalies	16%	20%	17.9%	26%	16%	13.6%

In Iran, Study conducted by **Molaei A et al[14]**, reported that associated extra cardiac anomalies with CHD was 16%.
Khalil A et al.[7] noted an incidence of 17.9% of somatic anomalies in patient with congenital heart disease.
Islam MN et al.[9] reported in his studied that 16% cases had non cardiac and somatic anomaly.
Above studies were similar to present study

Clinical profile

Presenting symptoms: mostly babies presented with symptoms of breathing difficulty (75.34%) followed by feeding difficulty (45.20%) , cyanosis(bluish discoloration)(6.84%) respectively.
Presenting signs: most common sign was murmur(91.78%) followed by tachycardia (54.79%), tachypnea (56.16%), chest retraction(44.28%), cyanosis(19.44%) ,hypotension(9.72%), bounding pulse(15.27%) respectively.
In **Ravilala VK et al. [10]** and **Amroliwala et al.[5]** had similar observation that respiratory distress (68%) was the most common.
Similar findings were noted in **Kasturi L et al.[15]**

Investigation

Chest radiograph

Out of 73 cases, abnormal chest x ray was noted in 57.53% and rest 42.46% neonates had normal chest x ray finding
From 73 cases it was found chest X-ray abnormal in 57.53% of cases and Abnormality noted was cardiomegaly (24.65%),oligemia(6.84%), plethora(8.7%),lung opacity(9.58%),boot shaped heart(4.10%).
The existence of cardiac disease should be strongly suspected if a neonate exhibits any combination of the following two characteristics, including cyanosis, CHF, a murmur, an irregular pulse, or an abnormal ECG. [66]
Similar results were also seen in **Amroliwala et al. [5]**, abnormal chest x ray finding was seen in 68% and rest 32% neonates had normal chest x ray finding.CXR is a simple, quick and cheap test that yields useful diagnostic information, heart size, lung pathology as well as providing a readily available documentation of these facts for serial comparison.[86]

Echocardiography

Type of congenital heart disease

In the present study 19.17% were of cyanotic type of CHD while 80.82% constituted to Acyanotic type of CHD
Amongst acyanotic CHD cases; commonest was ASD in (27.4%), followed by PDA in (26.02%) then VSD in (9.58%) .
Amongst Cyanotic cases, maximum incidence was of TGA (5.47%) cases; followed by TAPVC and COMPLEX CHD in (2.73%).
Similar observations were also seen in **Amroliwala et al.[5]** study were 18.8% were of cyanotic type of CHD while 81.2% constituted to Acyanotic type of CHD.
Kasturi L, et al.[16] noted similar study, 19% belonged to cyanotic group where as 81% belonged to Acyanotic group.
In **Mir, et al**.[17] study majority of neonates had acyanotic congenital heart disease (72.2%) while cyanotic congenital heart disease compromised (27.7%)
Ravilala VK et al.[10] noted 37% had of cynotic heart disease and 63 % as acynotic heart disease.
Similar observation was found in **Shah GS,et al[8]** where in cyanotic congenital disease constituted 31% and acyanotic 69%.
In study by **Amroliwala et al.[5]** showed equal distribution.
In present Study out of 73 cases of CHD neonates with associated co morbid condition were 60(82.1%) and 13(17%) were without any associated comorbid condition. Out of Inborn most common associated co morbid condition were sepsis 14(29.78%),RDS 9(19.14%) followed by TTN in 7(14.89%) and prematurity in 6(12.76%).

While in outborn(26) babies, most common associated co morbid condition were prematurity in 11(42.30%), sepsis in 10(38.46%), pneumonia in 7(26.92%), RDS in 4(15.38%).
Distribution similar to this study was also seen in study of **Amroliwala et al.**[5] 72.46% had associated co morbid condition while 27.53% were without any associated co morbid condition.
Similar observation was also seen in **Ravilala VK et al.**[10] study.
In addition to being influenced by the availability of facilities for early detection, supportive treatment, and surgical correction, **Khalil A et al**[7] stated that neonatal mortality is depending on the quality of perinatal care because of preterm, low birth weight, infections, hypoxia, etc. All of these factors contributed to 60% of newborn deaths in infants with CHD.

Treatment
Out of 73 babies (45.20%) received Inotropes, (64.38%) received oxygen, (42.46%) were ventilated, (2.73%) received Furosemide,(1.36%) received digoxin, (17.80%) received paracetamol.
Similar distribution was also seen in **Ravilala VK et al.**[10] and **Amroliwala et al.**[5].
According to **Molaei A et al**[14], medicinal therapy and mechanical ventilation were the most often used therapeutic approaches for the overall care of CHD.

Outcome
In present study out of 73 babies 50(68.49%) were discharged, 4(5.47%) went left against medical advice (LAMA), 12(16.43%) were referred to higher centre for surgery and 7(9.58%) babies expired.
In our study out of **7 expired babies**, none had cyanotic CHD while 7(9.58%) had Acyanotic CHD. Cases with Acyanotic type CHD, had PDA,PDA+ASD DA+ASD+VSD along with co morbid condition like severe birth asphyxia, RDS, LOS, shock, downs syndrome got expired
In present study, out of 73 cases 4(5.47%) babies were **left against medical advice(LAMA)** out of them 1(1.36%) were having cyanotic type of CHD while 3(4.10%) were having Acyanotic CHD.
In our study, out of 73 cases of CHD, 12(16.43%) babies were **referred** for surgery. Out of them 11(15%) babies had cyanotic CHD and 1(1.36%) had Acyanotic CHD.
According to **Humayun NK et al.**[11]. 63.6% of newborns survived, while 36% perished.
Khalil A et al.[7] reported a survival rate of 76.75% and a death rate of 23.25 %.
Similar to our study
In **Amroliwala et al.**[5] study 67.14% were discharged, 7.14% babies expired.
The relationship between Early-Term delivery and a composite neonatal mortality and morbidity outcome, which includes neonatal death, respiratory problems, sepsis, hypoglycemia, and the need for neonatal intensive care, was examined by **Tita et al. in**[18].

Short outcome
Out of 73 cases of CHD, 45(61.64%) came for regular follow up out of which 27(60 %) had absolutely normal echo on follow up while other 18(40 %)had abnormalities .other 15(20.54 %) lost to follow up while rest 13(17.80 %) were expired.
Out of 45 follow- up,23.2% of children suffered from respiratory tract infection and 9.5% had complain of not gaining weight(either can be due to prematurity or underlying CHD or can be both), while 40% children thrived well.
In a similar study **Ravilala VK et al.**[10] Nearly half of the cases survived the neonatal period and these children were followed up out of which 35% of children suffered from repeated respiratory tract infection and 21% had poor weight gain.

Conclusion
Congenital cardiac disease occurred in 7.23% of newborns admitted to the NICU and 11.8 per 1000 live births among newborns born at the Dhiraj Hospital. The overall male to female ratio is 1.57:1 The majority of newborns with CHD (75.23%) were LBW. Among newborns with CHD, 48.4% were preterm. CHD was diagnosed ≤ 7 days of life in 83.5% and 16.39% in >7 days of life. Most of the time, there was no immediately apparent aetiology for CHD. 15(20.54%) mother had significant antenatal history. Out of which, 2(2.73%) mothers had fever without rash, 4(5.45%)mothers suffered from diabetes mellitus, 3(4.16%) suffered from hypertension., 2(2.73%) mother had hypothyroidism, 1(1.36%) mother was covid positive,1(1.36%) mother had h/o uterine abnormalities and had in-vitro fertilisation . Of 73 babies Neonates with associated co morbid condition were 60(82.1%) and 13(17%) were without any associated co morbid condition. Out of 73 babies 59(80.82%) were having Acyanotic CHD and 14(19.44%) had Cyanotic CHD. Amongst 59 Acyanotic CHD cases; commonest was ASD in 20 (27.4%), followed by PDA in 19 (26.02%), VSD in 7(9.58%) . Amongst Cyanotic 14(19.17%) cases, maximum incidence was of TGA 4 (5.47%) cases; followed by TAPVC and COMPLEX CHD in 2 (2.73%).

Summary 119 Out of 73 babies with CHD; 31(42.46%) were normal and rest 42(57.53%) had abnormal chest x ray findings. Amongst 42(57.53%) cases of Abnormal chest x ray, maximum presentation was with cardiomegaly in 18(24.65%) followed by Lung opacity 7(9.58%),pulmonary plethora in 6(8.22%), pulmonary oligemia in 5(6.84%) , right side aortic arch and egg shaped heart in 4(5.47%) ,boot shaped heart in 3(4.10%)and pleural effusion 1(1.36%). Out of 73 babies in Inborn(47) most common associated co morbid condition were sepsis 14(29.78%),RDS 9(19.14%) followed by TTN in 7(14.89%) and prematurity in 6(12.76%).While in outborn(26) babies, most common associated co morbid condition were prematurity in 11(42.30%), sepsis in 10(38.46%), pneumonia in 7(26.92%), RDS in 4(15.38%). Out of 73 babies 50(68.49%) were discharged, 4(5.47%) went left against medical advice (LAMA), 12(16.43%) were referred to higher centre for surgery and 7(9.58%) babies expired. Out of 73 cases of CHD ,45(61.64%) came for regular follow up out of which 27(60 %) had absolutely normal echo on 3 rd month follow up (this may be probable because most of the CHD's like ASD, PDA and small muscular VSD's get closed spontaneously), while other 18(40 %)had abnormalities ,other 15(20.54 %) lost to follow up while rest 13(17.80 %) were expired. Out of 45 follow- up,23.2% of children suffered from respiratory tract infection because of pulmonary over circulation due to shunting and mixing of blood and 9.5% had complain of not gaining weight either because of prematurity ,high metabolic rates ,repeated infections or underlying CHD or both, while 40% children thrived well.

Consent

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

Ethical approval

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

Competing interests disclaimer

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly used products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

References

1. Perloff JK. The clinical recognition of congenital heart diseases. 4th ed. Philadelhpia : Saunders;1998. P. 1-3.
2. Friedman WF, Silwerman N. Congenital heart disease in infancy and childhood. In: Braunwald heart disease. A textbook of cardiovascular medicine. 6thed. Philadelhpia : Saunders;2001.p.1505.
3. Saxena A. Symposium on pediatric cardiology – II. Congenital heart disease(CHD) in India: A status report. Indian J Pediatr 2005;72:595-598.
4. Hoffman JIE. Congenital heart disease : Incidence and Inheritance. PediatrClint North Am 1990; 37:25-43.
5. Amroliwala, Rakesh, et al. "Study of Congenital Heart Diseases in Neonates | Amroliwala | International Journal of Contemporary Pediatrics International Journal of Contemporary Pediatrics, 21 Dec. 2017, dx.doi.org/10.18203/ 2349-3291.ijcp20175541..
6. Ali, M. B., Haque, S. D., Saha, A. K., Faruquzzaman, .-., Kabir, M. A., & Islam, S. (2021). Incidence, pattern and presentation of Congenital Heart Disease in neonates in southern part of Bangladesh. Mediscope, 8(1), 27–32.
7. Khalil A, Aggarwal R,Thirupuram S, Arora R. Incidence of congenital heart disease among hospital live births in India. Indian Pediatr 1994;31:519-24.
8. Shah GS, Singh Mk, Pandy TR, Kalkheti BK, Bhandari GP. Incidence of congenital heart disease in tertiary care hospital. Kathmandu Univ Med J 2008;6:33-36.
9. Islam MN, Hossain MA, Bhuiyan MKJ. Prevalence of congenital heart disease in neonate in tertiary level hospital.Nepal journal of medical science 2013;2(2):91-95
10. Ravilala, V. K., Kotla, S., T., R., & Malava, R. (2018). Study of congenital heart disease in neonates: clinical profile, diagnosis, immediate outcome and short-term follow-up. International J ournal of Contemporary Pediatrics, 5(4), 1304.
11. Humayun KN, Atiq M. Clinical profile and outcome of cyanotic congenital heart disease in neonates. J Coll Physician Surg Pak 2008;18:290-293.
12. Farooqui R, Farha U, Rehan N.congenital heart disease in neonates. journal of ravalpindi medical college;2010;14:31-32.

13. Somerville J, Grech V. The chest x-ray in congenital heart disease 2. Images Paediatr Cardiol. 2010 Jan;12(1):1-8.
14. Molaei A, Asadi G, khoshbakht M. Prognosis of the newborns with congenital heart diseases.Auatralian international academic center,2015;3;49-55.
15. Tank S, Malik S, JoshiS.Epidemiology of congenital heart disease among hospitalized patients. 2008;11(8):12-15.
16. Kasturi L, Kulkarni AV, Anin A, Mahashankar VA. Congenital heart disease : Clinical spectrum. Indian Pediatr 1999;36:953.
17. Mir, A., Jan, M., Ali, I., Ahmed, K., & Radhakrishnan, S. (2019). Congenital heart disease in neonates: Their clinical profile, diagnosis, and their immediate outcome. Heart India, 7(2),
18. Tita AT, Landon MB, Spong CY.Timing of elective repeat cesarean delivery at term and neonatal outcomes. N Engl J Med. 2009;360:111-120.