

Original Research Article

Study the universal critical congenital heart disease screening in a peripheral area of Uttarakhand, India

Ravi Sahota¹, Navpreet Kaur¹, Gural Singh¹, Veena Joshi¹, Bharti Gahtori¹,
Divya Mehrotra¹, Nisha Upadhyay^{2*}

¹Private Practitioners, Sahota Super-Specialty Hospital, Kashipur, Uttarakhand, India

²Department of Pediatrics, GMERS Medical College & Civil Hospital, Gandhinagar, Gujarat, India

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*Correspondence:

Dr. Nisha Upadhyay,

E-mail: drnishaupadhyay@gmail.com

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ABSTRACT

Background: Congenital heart disease (CHD) is the most frequently occurring congenital disorder, responsible for 28% of all congenital birth defects. The birth prevalence of CHD is reported to be 8-12/1000 live births. Considering a rate of 9/1000, about 1.35 million babies are born with CHD each year globally. Objective of research work to study the prevalence of CHD among newborn and its types.

Methods: This cross-sectional study was carried among 34 cases of CHD/5126 newborn screened at 4 birthing places in Kashipur a small town in Uttarakhand at pediatrics department of Sahota Super-specialty hospital, Kashipur, Uttarakhand. Screening program between 22 August 2014, and March 30, 2019. All newborns, including preterm babies, delivered in these facilities were eligible for inclusion in this study.

Results: Present study found the prevalence of CHD was 0.7 per 1000 children (34/5126). Around 26.5% participants have cyanotic CHD and 73.5% have acyanotic CHD. Almost 44%, 28%, 20%, 4% and 4% participants of acyanotic congenital heart diseases have VSD, ASD, PDA, AVSD and valvular PS respectively and 55.6%, 22.2%, 11.1% and 11.1% participants of cyanotic congenital heart diseases have TOF, DORV/VSD, dTGA/VSD and tricuspid atresia respectively.

Conclusions: Screening for congenital heart disease should be included as a part of newborn assessment as it is a common congenital problem. Early identification influences outcome. Barriers in implementation of the screening programmes in resource limited setting is a challenging feature. This study can provide observed data that can help in policy making in the health sector.

Keywords: Acyanotic, Congenital heart disease, Cyanotic, Oximetry, Screening, VSD

INTRODUCTION

According to the National Family Health Survey, the infant mortality rate (IMR) in India stands at 34 per 1000 live births.¹ Congenital heart disease (CHD) is the most frequently occurring congenital disorder, responsible for 28% of all congenital birth defects.² The birth prevalence of CHD is reported to be 8-12/1000 live births.^{3,4} Considering a rate of 9/1000, about 1.35 million babies are born with CHD each year globally.⁵

Of infants with CCHD, up to one third is reported to have encountered sudden respiratory distress or circulatory collapse because of delay in diagnosis. The major targets of screening by pulse oximetry screening for CCHD include hypoplastic left heart syndrome (HLHS), pulmonary atresia (PA), tetralogy of Fallot (TOF), total anomalous pulmonary venous return (TAPVR), d-transposition of the great arteries (d-TGA), tricuspid atresia (TA), and truncus arteriosus.⁶⁻⁸ The secondary targets include coarctation of the aorta (CoA), double-

outlet right ventricle (DORV), Ebstein anomaly, interruption of aortic arch (IAA), and single ventricle. Since 2011, pulse oximetry has been recommended as a screening tool for CCHD in newborn, in the USA and there has been a growing number of clinical trials on the subject.⁹⁻¹¹ so, the present study was carried out with the objective to study the prevalence of CHD among newborn and its types.

METHODS

This cross-sectional study was carried among 34 cases of CHD/5126 newborn screened at 4 birthing places in Kashipur a small town in Uttarakhand at pediatrics department of Sahota Super-specialty hospital, Kashipur, Uttarakhand. Screening program between 22 August 2014, and March 30, 2019 after ethical clearance of institutional ethical committee. Inclusion criteria was all term Newborn babies who are hemodynamically stable, all preterm babies >35 weeks and all babies in NICU. Exclusion criteria was severe grade 3 birth asphyxia and babies <35 weeks. When attending the birthing facilities for childbirth, parents were informed that screening was available for CCHD. Of newborns who participate this screening, a verbal informed consent was obtained from the parents. If the parents refused to allow screening for CCHD, parents signed a written informed dissent. For health education and reinforcement, leaflets which listed the possible symptoms of CCHD and false-negative possibility were given to all parents. If a newborn failed the CCHD screening, an on-call pediatrician was required to perform clinical examination immediately, and the newborn was referred for urgent echocardiography.

The Nursing Team at Sahota Superspeciality Hospital was responsible for submitting the data for screening-positive infants. Included in the confirmation report were the relevant prenatal diagnosis, findings of physical examination, and results of diagnostic evaluation (e.g., electrocardiography, chest radiography, and echocardiography) and managements.

RESULTS

Over the 4 ½ years of study period, 5645 live births were reported from the participating facilities. Of those eligible for screening, 5126 newborns (coverage rate: 5126/5645=98.6%) underwent pulse oximetry.

Table 1: Socio-clinical parameters of study participants (n=34).

Variables	Number (%)
Type of CHD	
Cyanotic	9 (26.5)
Acyanotic	25 (73.5)
Gender	
Male	22 (57.9)
Female	12 (42.1)

Table 1 shows that 26.5% participants have cyanotic CHD and 73.5% have acyanotic CHD. Almost 57.9% participants were male and 42.1% were female participants.

Table 2: Age-wise distribution of acyanotic congenital heart diseases (n=25).

Diagnosis	Age (0–28 days)
VSD	11
ASD	7
PDA	5
AVSD	1
Valvular PS	1

ASD: Atrial septal defect, VSD: Ventricular septal defect, PS: Pulmonary stenosis, PDA: Patent ductus arteriosus, AVSD: Atrio-ventricular septal defect

Table 2 shows that 44%, 28%, 20%, 4% and 4% participants of acyanotic congenital heart diseases have VSD, ASD, PDA, AVSD and valvular PS respectively. Table 3 shows that 55.6%, 22.2%, 11.1% and 11.1% participants of cyanotic congenital heart diseases have TOF, DORV/VSD, dTGA/VSD and tricuspid atresia respectively.

Table 3: Age-wise distribution of cyanotic congenital heart diseases (n=9).

Diagnosis	Age (0-28 days)
TOF	5
DORV/VSD	2
dTGA/VSD	1
Tricuspid atresia	1

TOF: Tetralogy of fallot, DORV: Double-outlet right ventricle, VSD: Ventricular septal defect, D-TGA: D-transposition of great arteries

DISCUSSION

Present study found the prevalence of CHD was 0.7 per 1000 children. The highest number of cases was seen between 1 month and 6 years of age.

Table 4: Comparison of prevalence of CHD of present study with previous study.

Study	Prevalence per 1000
Vaidyanathan et al 2011¹²	3.1
Sawant et al 2013¹³	13.3
Gupta et al 1992¹⁴	0.8
Vashishtha et al 1993¹⁵	5.2
Saxena et al 2013¹⁶	2.3
Nisale et al 2016¹⁷	0.4
Present study	0.7

In present study, CHDs were more common among the male 22 (58.0%), with a male-to female ratio of 1.8:1.

Present study shows that the male preponderance which is similar to other studies showed male-to-female ratio of

1.78: and 2.08: respectively.^{18,19} This male dominance pattern could be due to Indian social and cultural factors. Neglect, differential treatment, or poor access to health-care facilities is putting girls at disadvantages. Moreover, this could be the reason for less female child seeking the health-care facilities.²⁰

In the present study, incidence of cyanotic CHD was 26.5% and acyanotic CHDs was 73.5%. Ventricular septal defect (44%) was the most common CHD found in present study. In acyanotic CHD, after ventricular septal defect, atrial septal defect 28% and patent ductus arteriosus 20% were the commonly occurring CHDs. Present study results are correlate with the study done by Bhat et al, who stated that ventricular septal defect was most common in 30.4% patients.²¹

This incidence of VSD actually overestimates the haemodynamically significant VSDs. The low incidence rate of PDA can be due to exclusion of hemodynamically insignificant PDA in neonatal age. The lower incidence rate of AVSD is attributed that AVSD is usually associated with trisomy 21 and higher attrition rate of children with trisomy may lead to lower incidence of AVSD.²⁰

In present study the most common cyanotic CHD was tetralogy of Fallot 55.6% followed by DORV in 22.2% cases. This finding is comparable with the similar study done by Patra S et al and compared to low to the similar study done by Abqari S et al.^{22,18} This low incidence can be explained as authors have included only classical TOF and the other variants of VSD PS physiology are grouped separately.

This increased evidence of complex CHD can be due to high rate of consanguineous marriage in this part of India. Besides, being the main referral unit for sick neonates, most of neonates with complex CHD are diagnosed at our centre. Furthermore, the antenatal diagnosis of congenital heart defects is still in infancy in this region, with very small percentage of pregnant ladies going for fetal echocardiography.²⁰

For health education and reinforcement, all the parents of screened children were provided with verbal and printed leaflet detailing the screening program and the significant abnormal symptoms and signs of CCHD. If any abnormal symptoms and signs noted, looking for medical service as soon as possible is suggested.

CONCLUSION

Screening for congenital heart disease should be included as a part of newborn assessment as it is a common congenital problem. Early identification influences outcome. Barriers in implementation of the screening programmes in resource limited setting is a challenging feature. This study can provide observed data that can help in policy making in the health sector.

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Conflict of interest: None declared

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