

Original Research Article

To estimate the yield of Pulse Oximetry as a screening tool to detect CCHD in term Intramural Newborns

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Abstract

Background & Methods: The aim of the study is to estimate the yield of Pulse Oximetry as a screening tool to detect CCHD in term Intramural Newborns. Asymptomatic newborns who had oxygen saturation more than 95% were asked to report immediately in case of any symptoms developed related to cardiovascular disease so as to determine false negative results.

Results: Out of 4 critical CHD. Baby with DORV with complete AV CANAL DEFECT was having least oxygen saturation. In group A babies with cyanotic heart disease had mean oxygen saturation of 84.7%.

Conclusion: The prevalence of congenital heart disease in present study on the basis of location saturation and subsequent echocardiography was 22 in 6000 cases and prevalence of critical CHD is 3.6 in 6000 live birth that is 0.7 in 1000 live birth who were born in this hospital.

This study indicates that pulse oximetry is a noninvasive, reliable and useful screening tool for the early detection of congenital heart diseases especially cyanotic congenital heart diseases. The normal oxygen saturation (negative pulse oximetry screening) does not rule out CHD, especially acyanotic congenital heart disease.

Keywords: pulse oximetry, CCHD, intramural & newborns.

Study Design: Observational Study.

1. Introduction

The best protection is early detection. Screening for congenital heart diseases (CHD) in newborn babies is crucial and not only in early recognition but timely intervention with the prospect of improved outcomes[1].

Congenital heart defects (CHDs) constitute the most common group of congenital malformations, with an estimated incidence of 4 to 10 cases per 1000 live births with significant geographical differences. Asia reported the highest prevalence, that is 9.3 per 1000 live births compared with 8.2 and 6.9 per 1000 live births in Europe and North America, respectively[2]. Approximately 25% of children with CHD have critical CHD

(CCHD), a structural defect associated with significant risk of morbidity and mortality that requires surgical or catheter intervention before one year of age[3]. CCHD account for more deaths than any other congenital malformation and up to 10% of all infant deaths are due to them.

Prior to the widespread introduction of CCHD screening, it was estimated that up to one-third of infants with a potentially life threatening CCHD lesion left the hospital undiagnosed[4]. It has been shown that infants with CCHD who receive a delayed diagnosis have significantly higher mortality than those recognized prior to hospital discharged with up to 40% presenting in cardiogenic shock and resulting in the deaths of 70-100 infants annually. These data underscore the importance of early recognition of CCHD in neonates. Further, most of them return to hospital in a circulatory collapse, but around five percent of the babies die in the community without a diagnosis[5].

Critical congenital heart disease (CCHD) is a subset of CHD that requires invasive intervention or results in death within the first month (or first year by some definitions) of life. This definition is rather arbitrary because some cases of CCHD may be diagnosed or require intervention only after the first year. In the literature, CCHDs have also been categorized as serious and life threatening or major CHD[6]. In general, these are cardiac defects that are dependent on the ductus arteriosus for pulmonary or systemic circulation, or are mixing lesions.

2. Material and Methods

The present study was carried out in post Natal ward of MYH hospital and MTH hospital, INDORE. After taking written informed consent from parents All asymptomatic intramural then newborns were evaluated further with echocardiography for confirmation of congenital heart disease.

INCLUSION CRITERIA: All Asymptomatic intramural newborn who were born from March 2021 to March 2022.

EXCLUSION CRITERIA: Those new ones who were diagnosed antenatally and those who were symptomatic at the time of screening

We have divided study population in 3 groups

Group A where oxygen saturation was less than 90%

Group B where oxygen saturation world 90-94%

And Group C where oxygen saturation was more than 95%

Asymptomatic newborns who had oxygen saturation more than 95% were asked to report immediately in case of any symptoms developed related to cardiovascular disease so as to determine false negative results.

3. Result

Table No. 1: Gender

Gender	Number	%
Male	3480	58
Female	2520	42
Total	6000	100

A total of 6000 asymptomatic newborns were enrolled in the study and screened by pulse oximeter. Males were 3480 (58%) and females were 2520 (42%). Screening was done at a median age of 34 hrs. Birth weight ranged from 1.8kg to 4.3kg & Average birth weight was 2.2 kg.

Table No. 2: SATURATION RANGE

Saturation (%)	Number	%
<90	30	0.5
90-94	36	0.6
>95	5934	98.9

A total of 6000 were screened. Out of which 5934 babies had saturation of $\geq 95\%$. Which were screened as negative. 66 babies had saturation of $< 95\%$ who were screening positive. Out of which only 30 babies had oxygen saturation below 90%. While 0.6% (36) of screened babies were having oxygen saturation between 90-94%.

Table No. 3: POSITIVE SCREENING WITH OXYGEN SATURATION 90-94% GROUP B

Heart diseases	Number	%
Critical CHD	0	0
Acyanotic CHD	14	38.8
NAD	22	61.2
Total	36	100

Among group B only 38.8% babies were having acyanotic heart disease on echocardiography while most of them (61.2% babies had structurally normal heart.

Table No. 4: CARDIAC LESION WITH SATURATION <90 % (CYANOTIC)

Sr. No	Cardiac Lesion	Mean Saturation
1	DORV With Complete Av Canal Defect	62
2	Double Inlet Ventricle With Severe Coarctation of Aorta	68
3	Cardiac TAPVC	76
4	D-TGA with VSD with PDA	66

Out of 4 critical CHD. Baby with DORV with complete AV CANAL DEFECT was having least oxygen saturation

4. Discussion

Among all Birth defect congenital heart diseases is single most important cause of infant morbidity and mortality. The best diagnostic technique for detecting congenital heart disease is echo cardiography however it is expensive not easily available and needs clinical expertise. Pulse oximetry is a noninvasive simple inexpensive and easily available tool which can be used for the early detection of congenital heart disease[7]. Hence the aim of the study is to evaluate the use of pulse oximetry as a screening tool for early diagnosis and treatment of symptomatic new ones and thereby decreasing the morbidity and mortality associated with the conditions.

Out of 6000 screened babies most of the babies were male and Most common mode of delivery was a normal vaginal delivery. There are higher chances of developing congenital heart disease in low birth weight newborns then those with a weight more than 2.5 kg[8].

The present study is a prospective study. 6000 full-term healthy newborns delivered in the department of obstetrics and gynecology MGM Medical College and MY hospital from February 2022 - February 2023. Who were asymptomatic from 24 hours to 48 hours were screened. In present study 6000 newborns was divided into 3 groups on the basis of oxygen saturation and with less than 95% oxygen saturation regarded as critical for screening of CHD[9].

The prevalence of CHD reported world over by various other studies has been ranging from 1 in 1000 live birth to 17.5 in 1000 live births. In Indian literature also the prevalence has raised from 2.2 per 1000 live birth as reported from Shimla to as high as 50 per 1000 live births from Chandigarh.

In our study out of 6000 newborns 28% of newborns where low birth weight LBW. WHO and UNICEF survey was done on the country's regional and global estimate of LBW it was found that low birth weight incidence in the world is 15% and in India that is 30% finding is in concordance with the above references.

Present studies showed that there is association between low birth weight and congenital heart disease there is 1.3 times more chance of developing congenital heart disease in newborns which is who are less than 2.5 kg then those of who's birth weight more than 2.5 kg JUDITH PODDAR ET AT conducted a study and found that low birth weight may coexist with 35% of the neonate with CHD[10].

The present study found Group A with spo2 less than 90% echocardiography was normal in 49% of the cases ,while 13.3% of the case was having critical CHD whereas 46% were having a cyanotic CHD.

5. Conclusion

The prevalence of congenital heart disease in present study on the basis of location saturation and subsequent echocardiography was 22 in 6000 cases and prevalence of critical CHD is 3.6 in 6000 live birth that is 0.7 in 1000 live birth who were born in this hospital.

This study indicates that pulse oximetry is a noninvasive, reliable and useful screening tool for the early detection of congenital heart diseases especially cyanotic congenital heart diseases

The normal oxygen saturation does not rule out CHD, especially cyanotic congenital heart disease.

6. References

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