

# Knowledge, Attitude and Practices among Health Care Professionals on Screening of Congenital Heart Diseases in Newborns

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**Background:** There are no guidelines and recommendations for routine universal newborn screening for congenital heart diseases using pulse oximetry in India.

**Objectives:** To evaluate the knowledge, attitude, practices among health care professionals regarding screening for congenital heart disease (CHD) in newborns.

**Methods:** Email invitations as well as individual emails in the form of questionnaire using Google forms were sent to 500 healthcare professionals in India. The questionnaire consisted of multiple-choice questions. Two reminders for non-responders were sent by email after the initial invitation.

**Results:** Out of 500 e mails sent, a total of 178 responses (35.6%) were received. In terms of work experience, 10.2% of the respondents had more

than 20 years, 28.2% had 10 to 20 years, 28.2% had 5 to 10 years, and 33.4% had less than 5 years of experience. 98.7% of them agreed that mortality and morbidity due to CHD in newborns can be reduced by early diagnosis of CHD. In terms protocol followed in their units, 100% opined that all newborns are examined by pediatrician before discharge, only 2.9% reported that newborns get a pulse oximetry screening done and none reported the use of echocardiography for screening. Only 2.3% of the respondents felt that current practice was sufficient in detecting significant CHD. The overall mandate for pulse oximetry screening was 69.2%.

**Conclusions:** Health care professionals agree that current practice is not adequate for detecting significant CHD in newborns. 69.2% in this study recognized that universal routine pulse oximetry screening is mandated in newborns to detect CHD.

**Key Words:** Congenital Heart Disease (CHD); Early screening; Newborn; Pulse oximetry; Survey

## INTRODUCTION

Congenital heart disease (CHD) is one of the most common and significant birth defect, affecting 8 to 10 per 1,000 live born infants [1,2]. Although, the burden of CHD in India is enormous due to a very high birth rate, is often overlooked and resources are very limited. Early diagnosis and timely management of CHD with successful surgical repair or palliation decreases morbidity and mortality [2,4]. Delayed or missed diagnosis result in long-term morbidities and high mortality in infants with CHD [5-7]. Current clinical practice for detecting CHD in newborns depends mainly on routine physical examination carried out by a pediatrician before the newborn infants are discharged from the hospital. However, studies have shown that up to 50% of the CHD in newborns can be missed by routine cardiovascular examination [8,9].

In recent years, rapid advances have taken place in diagnosis and treatment of CHD. Amongst many aids, pulse oximetry has been proved to be an aid to clinical examination for detecting some forms of CHD [10-15]. Many developed countries have already implemented a universal pre-discharge screening programme using pulse oximetry. However, health care professionals and policymakers in India are still in doubt whether pulse oximetry should be a part of routine newborn screening. Collective opinions of health care professionals in India on screening for CHD in newborns are still not known. Therefore, this survey was aimed to evaluate the knowledge, attitude, current practices and opinions regarding newborn screening for CHD using pulse oximetry among health care professionals.

## MATERIALS AND METHODS

The survey based study was conducted for a period of 2 months from March 2017 to April 2017. The study was approved by the Institutional ethical committee JSS Medical College, Mysore. A cross sectional internet based

online survey in the form of a questionnaire was prepared using Google forms, which included multiple choice questions.

A total of 500 email invitations were sent using Google forms and also, forms were sent to individual e-mails to the pediatricians, neonatologists, pediatric cardiologists, obstetricians and other health care professionals from all over the country who were selected on a random basis. Two repeat email reminders were sent after the initial invitation. Basic information such as years of clinical practice since the completion of training, type of practice setting, location of practice, and primary expertise were collected from each of the respondents. Data collected from the filled in questionnaire was tabulated and was then subjected to descriptive statistical analysis.

## RESULTS

Among the total of 500 Google forms with questionnaire sent, 178 completely filled forms were received back. The response rate was 35.6%. Among respondents, 114 (64.1%) were males and 64 (35.9%) were females. Majority of the practitioners i.e., 91 (51.1%) belonged to the age group of 30-40 years, followed by 37 (20.8%) were less than 30 years, 34 (19.1%) were between 40- 50 years and 16 (8.9%) belonged to age group of above 50 years.

In our study, 60 (33.7%) practitioners had less than 5 years of experience, 50 (28.1%) practitioners had 5-10 years of experience, 50 (28.1%) had 10-20 years of experience followed by only 18 (10.1%) practitioners who had more than 20 years of clinical experience. The majority of respondents were practicing in a teaching hospital [107 (60.1%)], followed by 71 (39.9%) in private nursing homes. Among respondents, 130 (73%) were pediatricians, 27 (15.2%) were neonatologists, 7 (3.9%) were cardiologists, and 14 (7.9%) were other health care professionals (Obstetricians and general practitioners).

Practitioners were from different states of India, such as Karnataka, Andhra Pradesh, Tamilnadu, Maharashtra, and Delhi. However, the highest response was obtained from clinicians from the state of Karnataka, 113

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(63.5%). 163 (91.6%) practitioners were from the metropolitan area and cities and only 15 (8.4%) of respondents were from the rural areas and small towns. In this survey, 164 (92.1%) of the practitioners agree that there is limited data available on newborn screening and 131 (73.6%) agree that pediatric cardiac care is still in its infancy. The fact that early detection improves the outcome of CHD, was agreed upon by 176 (98.9%) of participants.

According to the survey, all newborns are examined by a clinician before discharge (100%). However, only 5 (2.8%) reported that they get a pulse oximetry reading before discharge. Newborn examination in post-natal wards is most commonly done by pediatricians (154, 86.5%). Among the practitioners who undertook the survey, 178 (82%) were familiar with newborn screening of CHD using pulse oximetry; however, only 67 (37.6%) have a protocol for CHD screening.

A clinical examination is performed at birth followed by at 6 weeks by 153 (85.9%) of practitioners. Specific cardiac investigations are performed only in high risk infants. Although, 123 (69.1%) agree pulse oximetry as a promising method for newborn screening (Figure 1). very few (2.8%) were using pulse oximetry routinely. There was no difference in opinion regarding the mandatory use of pulse oximetry as a screening method among the practitioners from university hospitals, children hospital, and private practice as well as from different locations across India. 164 (92.1%) of participants opined that pulse oximetry for screening needs further evaluation. 137 (76.9%) do not recommend universal ECHO screening. 128 (71.9%) believe that echocardiography, though has the highest detection rate, is more expensive and has false positive rate. As 78 (43.8%) of participants think screening causes' excessive anxiety among parents, 141 (79.2%) agree that psychosocial effects of screening should be considered and studied.

Addressing the best period for screening, 101 (56.7%) participants believe that antenatal and newborn period is the best period for screening. 164 (92.1%) feel that there is a great need for protocol for newborn screening and follow up to be developed. 169 (94.9%) are confident on counseling for screening of CHD. 148 (83.1%) feel newborn screening worth its cost. The main concerns expressed by the participants were lack of protocol for universal screening, feasibility in rural area and affordability.

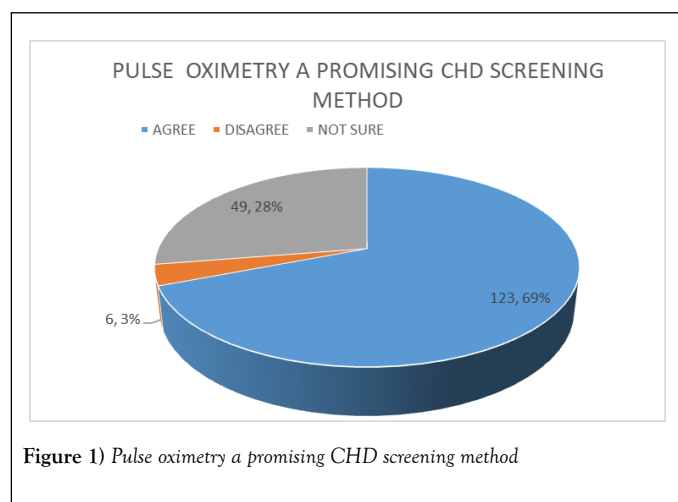


Figure 1) Pulse oximetry a promising CHD screening method

## DISCUSSION

Congenital Heart Disease has a high prevalence in India with a significant burden of morbidity and mortality associated with it [1,2]. Although an early diagnosis and treatment may improve outcomes, lack of screening methods may result in late diagnosis [2-4]. In India, current practices relies mainly on clinical examination and lacks a simple, sensitive and cost effective protocol. [16,17]. Critical CHD fulfills the generally accepted clinical criteria required to consider for screening of a disease

Pulse oximetry screening in addition to clinical examination is recognized as an important tool for the screening because of its apparent advantages. It is simple, noninvasive, easy to administer, does not require any expertise,

inexpensive, and easy availability in the most hospitals. In many parts of the world, researchers have evaluated the use of pulse oximetry as an aid to clinical examination for detecting significant forms of CHD [10-15]. Knowles et al. [18] has reviewed current practices and all other possible alternatives and concluded that "pulse oximetry is a promising alternative newborn screening strategy."

In systematic review done by Thangaratnam et al. [19], a review of eight prospective clinical pulse oximetry studies involving a total of 35,960 newborns [20-22] has been done. Pulse oximetry was found to be highly specific (99.8%) but sensitivity was found be relatively low (63%) [22]. Similar systematic review done by Valmari [23] concluded that pulse oximetry screening as an independent modality is not sensitive enough as 5 out of 10 newborns with coarctation of the aorta were missed by pulse oximetry screening in the studies reviewed. In a study done by Saxena et al, 19009 newborns were screened and concluded that pulse oximetry is a sensitive screening tool for detecting major CHDs in Indian newborns [24].

In a study done in China on a large cohort, pulse oximetry combined with clinical examination was able to detect more than 90% of critical CHD [25]. This survey was planned to collect the views of practicing health care professionals from all over India regarding the use of pulse oximetry as means of universal screening of CHD in newborns. However, in the current survey, only 2.9% of respondents reported that their primary hospitals are currently using pulse oximetry screening in addition to newborn cardiovascular examination to detect CHD.

In this survey, large number of respondents recognized the importance of an early diagnosis of CHD in newborns; a significant number felt that the current practice of screening of newborns for CHD, which relies mainly on clinical examination was inadequate. 69.1% of respondents supported a mandate for universal newborn screening using pulse oximetry. The support for pulse oximetry did not differ by region, practice setting area of expertise or with clinical experience.

Although a few prospective studies on pulse oximetry screening for CHD in newborns are reported in India, in most of the studies, sample size is small rendering the studies relatively underpowered given the relatively low incidence of CHD [12]. Hence large scale studies with good sample size may provide more clarity on many inconclusive technical questions such as the timing for screening (age of the neonates), the cut off of pulse oximetry reading for determining positive screens, the site for pulse oximetry reading, and the training requirement for personnel conducting the screens.

The concerns of respondents in this survey included the cost effectiveness of pulse oximetry screening, availability of pulse oximeter in rural areas, the costs of implementation, availability of adequate staff, development of necessary infrastructure for further confirmatory studies like echocardiography for positive screen babies, longer duration of hospital stay for babies with false-positive results the psychosocial impact on parents and proper referral services for further management. Large scale multicenter prospective studies are required to demonstrate the efficacy and benefits, cost effectiveness of pulse oximetry for newborn cardiac screening before considering mandatory universal screening of CHD using pulse oximetry.

In a similar survey done by Chang et al. survey was done among only pediatric cardiologists unlike in our study where all health care professionals were surveyed. In their survey, only slightly more than 50% respondents supported pulse oximetry screening. As 20% of their respondents were practicing pulse oximetry screening, they could survey advantages and disadvantages of pulse oximetry screening unlike a very limited experience among our respondents as only 2.9% were using pulse oximetry for screening [26].

Limitations of this study were low response rate of 35.6%, majority were from Karnataka and only 8.4% representing rural areas and small towns. The respondents had a very limited experience on the use of pulse oximetry as screening aid. This study aimed to evaluate the knowledge, attitude and practices of screening of CHD in newborns among pediatricians and other related health care professionals. The results cannot be extrapolated to recommend or discourage the use of pulse oximetry for universal newborn CHD screening.

**CONCLUSION**

Significant number of health care professionals opined that current practices of newborn screening for congenital heart diseases are inadequate for detecting significant CHD and recognized the importance of an early diagnosis of CHD in newborns. Although many health care professionals strongly support a mandate for pulse oximetry screening, concerns are expressed about the low sensitivity, feasibility and cost effectiveness in a poor resource setting. Many respondents of this survey have recognized the need for more data from large scale, multi-center (or multi-state) studies to recommend the use of pulse oximetry for universal newborn screening for congenital heart disease.

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