Original Research Article

Clinical profile and referral pattern among children with congenital heart disease (CHD) before and after introduction of the RBSK scheme

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Abstract

Background: Congenital Heart Disease (CHD) is the most common congenital malformation among children, often requiring intervention for survival. The nature of the defect, availability of optimum intervention at the right time and nutritional status of the children are the key determining factors of outcome. The Rashtriya Bal Swasth Karyakram (RBSK) Scheme was launched in India in 2013, to address 4D's; defects, deficiencies, diseases and developmental delay/ disability among 0-18-year-old children. RBSK is a big boon in this regard and has resulted in better coverage and cashless intervention in children with CHD. This programme is implemented through Govt. and accredited private facilities. **Objective:** To assess the clinical profile, nutritional status and referral pattern among children with CHD attending two tertiary care teaching institutions, one from Govt. and one from private sector, after the implementation of the RBSK Scheme and to compare the data with that from the Govt. facility, before implementation. **Methods:** Consecutive cases with CHD attendingtwo South Indian Centres, after the introduction of RBSK Scheme; SAT Hospital, Govt. Medical College, Thiruvanathapuram, Kerala, South India, a tertiary care teaching hospital in Govt. Sector (Centre A) and Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari Dst., Tamil Nadu, a tertiary care teaching hospital in Private Sector(Centre B), during the period, 2015- 2016, were enrolled. The children in subgroups A and C, were mostly in-born babies or those referred from other hospitals. The children in subgroup B were older children, referred from medical camps and school health programme. Referral pattern, type of CHD and nutritional status were recorded. These parameters were compared with similar unpublished data collected in 2010, from the Govt. facility, before the introduction of the Scheme. **Results:** There were 70 children in Centre A (subgroup A), 63 children in Centre B (subgroup B), compared to 64 in the pre-RBSK subgroup C. The socio-economic status was comparable in all three subgroups and majority belonged to middle and lower class. There was a significant increase in the referral of infants and those with critical CHDs in the Govt. facility, in comparison to older children and those with non-critical CHDs in the Private facility. There was a significant favorable trend ($P < 0.05$) towards female referral in the Govt. facility after the Scheme. In all three subgroups, majority were underweight and had varying grades of stunting and wasting, indicating both chronic and acute malnutrition. ACHD was more, compared to CCHD, in all three subgroups. Among ACHD, VSD and among CCHD, TOF were the most common defects. There was a positive trend in the referral of children who were severely underweight, stunted and was tedunder the scheme. **Conclusion:** There was significant difference in the clinical profile and referral pattern among children with CHD after the implementation of the RBSK Scheme and between the Govt. and the private facility. Majority were underweight, stunted and wasted, indicating both chronic and acute malnutrition. More children with critical CHD, infants, females and those with malnutrition were getting referred to the Govt facility and more older children and those with noncritical CHD were getting referred to the private facility under the Scheme. This comparative study is presented in view of its public health importance.

Key Words: Acyanotic CHD (ACHD), Cyanotic CHD (CCHD), Nutritional status, RBSK Scheme.

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Received Date: 21/02/2018 Revised Date: 10/03/2018 Accepted Date: 17/04/2018
DOI: https://doi.org/10.26611/1014613

How to cite this article: Elizabeth K E, Vidhya V K, Nargis R, Geetha V. Clinical profile and referral pattern among children with congenital heart disease (CHD) before and after introduction of the RBSK scheme. *MedPulse International Journal of Pediatrics.* April 2018; 6(1): 09-13. http://medpulse.in/Pediatrics/index.php

Access this article online

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Website: www.medpulse.in

Accessed Date: 20 April 2018

INTRODUCTION

Congenital Heart Disease (CHD) is the most common congenital malformation among children, often requiring intervention for survival. The nature of the defect, availability of optimum intervention at the right time and nutritional status of the children are the key determining factors of outcome. The prevalence of CHD varies based on the available diagnostic facilities and the detection rates. It is reported to be 0.6 to 9 per thousand live births, around one third of all birth defects (1). In India, the prevalence is reported to be 2.25 to 5.2 per 1000 live births (2). There is no single etiology for CHD. It is multifactorial; ranging from monogenic defects, chromosomal anomalies, environmental factors like teratogens to maternal diseases like diabetes mellitus. As the burden of CHD is high in developing countries like India, due to the high birth rate and in view of the critical nature of the CHD, many were dying or surviving with significant morbidity. The Rashtriya Bal Swasth Karyakram (RBSK) Scheme was launched in India in 2013, to address 4D's; defects, deficiencies, diseases and developmental delay/ disability among 0-18-year-old children (3). RBSK is a big boon in this regard and has resulted in better coverage and cashless intervention in children with CHD. This programme is implemented through Govt. and accredited private facilities. The health seeking behavior, referral pattern, clinical profile and nutritional status of CHD are likely to vary based on the available resourcesand from period to period. Under the RBSK Scheme, apart from the available Govt. facilities, several private centres also were also accredited for cashless interventions, including diagnostic facility. Thereafter, an obvious change has occurred in resources and the health seeking behavior.

MATERIAL AND METHODS

Consecutive cases with CHD attending two South Indian Centres, after the introduction of RBSK Scheme; SAT Hospital, Govt. Medical College, Thiruvanathapuram, Kerala, South India, a tertiary care teaching hospital in Govt. Sector (Centre A) and Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari Dst., Tamil Nadu, a tertiary care teaching hospital in Private Sector (Centre B), during the period, 2015- 2016, were enrolled. Intervention for CHD was not available in the private facility, except as a paid service, before the Scheme. The children in subgroups A and C, were mostly in-born babies or those referred from other hospitals. The children in subgroup B were older children, referred from medical camps and school health programme. Referral pattern, type of CHD and nutritional status were recorded. These parameters were compared with similar unpublished data collected in 2010, from the Govt. facility, before the introduction of the Scheme. Centre A is a major maternity and child care centre in the state of Kerala. It is not a cardiac intervention entre, but due to its proximity to Sree Chitra Thirunal Institute of Medical Sciences (SCTIMST), had the advantage of easy referral for immediate intervention, under the Scheme. Centre B is a cardiac intervention centre, where the RBSK scheme was available for intervention for CHD. Socio demographic data and dietary profile were collected using a structured proforma. Anthropometric measurements were done using standardized procedures, ensuring intra-observer reliability[4]. Nutritional status like weight for age, height for age, weight for height were computed and compared with New IAP growth charts, 2015[5]. Socio-economic status was assessed using the Modified Kuppuswamy scale[6]. Institutional Ethic Committee approval and parental consent were obtained prior to the study. Cardiac evaluation was done using X-Ray Chest, ECG and Echocardiogram, undertaken by qualified Paediatric Cardiologist, in all cases. Analysis of data was done using SPSS version 16.

RESULTS

Table 1: Baseline Characteristics, Nutritional Status and Type of CHD in the Study

Parameter	Subgroup A (n= 70)	Subgroup B (n= 63)	Subgroup C (n=64)
Age wise Distribution			
< 1 year	59 (84.3%)*	3 (4.7%)	34 (53%)
> 1 year	11 (15.7%)	60 (95.2%)	30 (47%)
Sex wise Distribution			
Male: Female Ratio	0.9: 1.45*	1.1:1	1.18:1
Nutritional Status			
Normal Weight	13 (18.6%)	16 (25.4%)	22 (34.4%)
Underweight (Mild, Moderate and Severe)	57 (81.4%)*	47 (74.6%)*	42 (65.6%)
Severely underweight.	35 (50%)*	11 (17.5%)*	6 (9.3%)
No Stunting	27 (38.6%)	24 (38%)	47(73.4%)
Stunted (Mild, Moderate and Severe)	43 (61.4%)*	39 (61.9%)*	17 (26.6%)
Severely stunted.	22 (31.4%)*	6 (9.6%)*	1 (1.6%)
No wasting	29 (41.4%)	10 (15.9%)	51 (79.7%)
Wasted (Mild, Moderate and Severe)	41 (58.6%)*	53 (84.1%)*	13 (20.3%)
Severely wasted	24 (34.3%)*	12 (19%)*	5 (7.8%)
Type of CHD			
ACHD	45 (64.3%)	51 (81%)	48 (75%)
CCHD	25 (35.7%)*	12 (19%)	16 (25%)

* P < 0.05

Table 2: Type of CHD in the Three Subgroups

Type of CHD	Subgroup A (n=70)	Subgroup B (n=63)	Subgroup C (n= 64)
ACYANOTIC CHD	**No. (%)**	**No. (%)**	**No (%)**
ASD	9 (12.9)	19 (30.2) *	16 (25)
VSD	15 (21.4)	21 (33.3)	17 (26.5)
PDA	6 (0.9)	7 (11.1)	15 (23.4) *
Others: Complex Anomalies	15 (21.4) *	4 (6.3)	0 (0)
Total	**45 (64.3)**	**51(81)**	**48 (74.9)**
CYANOTIC CHD	**No.** (%)	**No.** (%)	**No (%)**
TOF	9 (12.9)	9 (14.3)	5 (7.8)
Others: Complex Anomalies	16 (22.9)	3 (4.8)	11 (17.1)
Total	**25 (35.7) ***	**12 (19)**	**16 (24.9) ***

* P < 0.05

There were 70 children in subgroup A (Govt. facility-post RBSK), 63 in subgroup B (Private facility- post RBSK) and 64 in subgroup C (Govt. facility- pre-RBSK). The baseline characteristics, nutritional status and type of CHD are summarized in table 1. Infants less than 1 year of age were more in subgroup A (84%), compared to<5% in subgroups B and 53% in subgroup C. The male to female ratio showed a significant favorable trend (P <0.05) towards female referral in the Govt. facility after the Scheme; 0.9:1.45 vs. 1.1:1 vs. 1.18:1 respectively. Majority, who were enrolled under the scheme belonged to middle and low socio-economic status in all three subgroups, reflecting the type of population availing the cashless facility. The Infant and Young Child Feeding (IYCF) Practices and food intake were suboptimum in majority of cases. In all three subgroups, majority were underweight and had varying grades of stunting and wasting, indicating chronic and acute malnutrition respectively. It was noted that more children with low weight, stunting and wasting were getting referred to both Govt. and Private facility after the introduction of the scheme. There was positive trend in the referral of children, who were severely underweight, stunted and wasted, compared to the pre-RBSK period. Stunting was more in children with CCHD, with chronic hypoxia. Acyanotic congenital heart disease (ACHD) was more, compared to Cyanotic Congenital Heart Disease (CCHD), in all three subgroups. CCHD was more in subgroup A

(35%), compared to 19% in subgroup B and 25% in subgroup C. Among ACHD, VSD and among CCHD, TOF was the most common defect. The proportion of non- critical CHDs like ASD and PDA were more in the private facility. More cases of Complex CCHDs were getting referred to the Govt. facility. The pattern of CHD in the subgroups is given in table 2.

DISCUSSION

The distribution of children with CHD varied, based on whether Govt. or private and as per the location of the centre and the time frame. The children attending the government facility in Kerala (Centre A) were younger; mostly inborn babies or referred from other hospitals. The children attending the private facility in Tamil Nadu (Centre B) were older; referred from camps and school health programs. The referral pattern varied as Center A was a tertiary care teaching hospital with proximity to a National Institute (SCTIMST)) catering to critical CHDs and Center B was a tertiary care teaching hospital, which has a cardiac intervention center undertaking both surgical and non-surgical procedures. The referral of older children under the scheme will help to address the backlog of cases with CHD. This will have a huge impact in the future, by reducing the waiting period to get early intervention. The RBSK scheme aims at early detection and early referral. Apart from age, there was a significant difference in the referral pattern of female babies for intervention. This is in accordance with the current trend on gender equality of children with CHD, compared to the male: female a ratio of 1.5:1, reported in an earlier study from Kathmandu[7]. This trend is encouraging. Majority belonged to lower middle and lower class, as per modified Kuppuswamy scale, Class III, IV. This reflects the health seeking behavior under the government schemes like RBSK, in both Govt. and private facilities. It may also be reflecting higher prevalence of CHD among those belonging to lower socio-economic status[8]. The IYCF Practices and food intake were suboptimum in majority of cases, attributable to the illness, recurrent infections, lack of information and continued motivation. Early cessation of breast feeding and suboptimum complementary feeding are known risk factors for malnutrition in children with CHD (9). Malnutrition is often the rule in children with CHD. Nutritional status depends on the type of cardiac defect and the co-morbidities. Dietary inadequacy and comorbidities contribute to malnutrition. Early nutrition screening and intervention are recommended in children with CHD for better outcome[10,11]. Various studies have reported high prevalence of malnutrition in children with CHD (12). Majority were underweight, especially severely underweight. Stunting indicating chronic malnutrition was also rampant. Stunting was more in those with CCHD, in accordance with a previous report by Varan *et al*. (13). This is attributable to the chronic hypoxia in children with CCHD. Like other studies, majority had varying grades of wasting, indicating acute malnutrition[14]. Comparison of nutritional status of children with CHD in the study with NFHS -4, 2015-16 data[15], showed significant differences, as detailed in table 1. Compared to 42.5%, who were underweight as per NFHS data, children with CHD were more underweight in all three subgroups. Compared to 48%with stunting as per NFHS data, children with CHD showed more stunting in all three subgroups. As compared to 19.8% with wasting and 6.4% with severe wasting as per NFHS data, wasting, especially severe wasting was more in children with CHD. Poor nutritional status is a known determinant of adverse outcome in children with CHD[12]. ACHD is more common than CCHD. Among ACHDs, ventricular septal defect (VSD) is the most common CHDamong children and PDA among newborn babies. Majority in the study had ACHD. VSD was the most common defect. The proportion of ASD and PDA was more common in the private facility, due to late referral. ASD is usually diagnosed in older children due to the late onset of symptoms. Among CCHD, TOF was most common. More Critical and complex CHDs got referred to the Govt. facility in the post-RBSK period. The difference in the pattern of CHDs in the three subgroups is attributable to the referral pattern and the difference in the age group of the participants. Centre A, the Govt facility had more younger children, referred from various hospitals and Centre B, the private facility had more older children, referred from camps and school health programmes. The facility for early screening and referral and cashless intervention under the RBSK Scheme is a very good initiative, especially for those belonging to low socio-economic status, as observed in the study. Thus, the RBSK Scheme is noted to be a big boon for children with CHD.

CONCLUSION

There was significant difference in the clinical profile and referral pattern among children with CHD, before and after the implementation of the RBSK Scheme and between the Govt. and the private facility. Majority with CHD were underweight, stunted and wasted, indicating both chronic and acute malnutrition, which is a known determinant of poor outcome. Stunting was more common in those with CCHD due to chronic hypoxia. More female children, those with critical CHD, infants and those with malnutrition were getting referred to the Govt facility, under the scheme. More older children and those with noncritical CHD were getting referred to the

private facility. Accreditation of the private facility is found to tackle the backlog of cases with CHD. This is going to have a very positive impact in future, that will result in early intervention of newly diagnosed cases. This comparative study is presented in view of its public health importance.

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Source of Support: None Declared
Conflict of Interest: None Declared