

Newborn Screening for Congenital Heart Disease Using Echocardiography and Follow-up at High Altitude in China

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Introduction: Screening newborns for congenital heart disease (CHD) mostly focuses on critical CHD using pulse oximetry. But this is inapplicable at high altitude due to variedly decreased arterial saturations. Altitude hypoxia induces pulmonary arterial hypertension that is main morbidity in left to right shunt CHD. We aimed to screen newborns for all forms of CHD using echocardiography at high altitude and follow up their outcomes.

Methods: Echocardiography was performed in consecutive asymptomatic 1,002 newborns in 3-5 days after birth (459 girls; 73(7.3%) Tibetan, 701(70.0%) Hui, Salar, and other ethnics, and 228(22.7%) Han; residence altitude range: 1,800-4,223 m, median 2,450 m) born in Xining, Qinghai between Mar 2015 and Aug 2016. Follow-up echocardiography was performed at 1-3, 6, and 12-18 months.

Results: The incidence of CHD was 27.8%(279/1,002) [140 girls; 16(5.7%) Tibetan, 179 (64.2%) Hui, Salar, and other ethnics, and 84(30.1%) Han]. Secundum atrial septal defect (ASD)[175(62.7%)] was the most dominant, followed by patent ductus arteriosus (PDA)[61(21.9%)], and ventricular septal defect (VSD)[8(2.9%)]. At 1-3 months follow-up in 98/279(35.1%), ASD, PDA, and VSD closed in 12.7%, 82.4, and 16.7%, respectively. At 6 months in 78/252 (31.0%), ASD, PDA, and VSD all closed in 50%. At 12-18 months in 85/208 (40.9%), ASD, PDA, and VSD closed in 64.2%, 72.2%, and 80.0% respectively. In total, among 173 babies with CHD (62.0% of 279) at follow-ups, 28.9% CHD babies remained unclosed. During follow-up period, 2 babies died of pneumonia at 4 and 6 months. The incidence of CHD and spontaneous closure were not correlated with altitudes and ethnics ($p > 0.1$ for all).

Conclusions: The incidence of CHD is many folds higher than that at low altitude, consisting solely of simple forms with left to right shunt in asymptomatic newborns. By 18 months of age, the incidence of CHD was 10%. Follow-up remains challenging due to the poor socioeconomic conditions, and must be reinforced in order to provide early repair and prevent from significant pulmonary arterial hypertension and even death.