

**Incidence and spectrum of congenital heart disease in the neonatal intensive care unit at high altitude in China: A retrospective study**

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Introduction: Previous studies including ours screening congenital heart disease (CHD) at high altitudes have reported substantially higher incidence as compared to that at low altitude, consisting almost solely of simple CHD with left to right shunt. Data on the occurrence of complex CHD at high altitude is scarce. Neonates with complex CHD are likely to be admitted to NICU. Therefore, the present study aimed to evaluate the incidence and spectrum of CHD in NICU in order to depict a truer picture of CHD at high altitude.

Methods: We retrospectively reviewed charts of 4214 neonates in the Women's and Children's Hospital in Xining (2,260 m), Qinghai province (average altitude 3000 m) in 2015-2016. Echocardiography was performed in 1943 babies (aged 10 minutes to 2 months; 1220 boys, 723 girls; altitude ranged 1,800 to 4,300 m, median 2,526 m) when CHD was suspected based on heart murmur, cyanosis or pneumonia.

Results: CHD was diagnosed in 1093 babies (56.3% in 1943 babies), making the incidence in total NICU patients 26%. They were hospitalized mainly because of pneumonia (62.6%), asphyxia (13.2%) and hyperbilirubinemia (7.3%). Mild and moderate CHD accounted for 97.6% (1067 babies), including 583 (53.3%) secundum atrial septal defect, 227 (20.7%) patent ductus arteriosus, 20 (1.8%) ventricular septal defect, 263 (24.1%) multiple defects with left to right shunt, 1 (0.1%) bicuspid aortic valve, 7 (0.6%) pulmonary stenosis, 2 (0.2%) aortic stenosis. Severe CHD accounted for 2.4% (26), including 6 (0.5%) atrioventricular septal defect, 5 (0.5%) complete transposition of the great arteries (TGA), 6 (0.5%) hypoplastic right heart, 3 (0.3%) hypoplastic left heart, 3 (0.3%) double outlet right ventricle, 3 (0.3%) tetralogy of Fallot, 2 (0.2%) truncus arteriosus, 2 (0.2%) total anomalous pulmonary venous connection, 2 (0.2%) severe aortic stenosis, 2 (0.2%) severe pulmonic stenosis. In 26 patients with severe CHD during the period of 2 to 12 months after discharge, 17 patients died before cardiac surgery, and 1 of the 4 survivors had arterial switch operation, and 5 lost track.

Conclusion: Our study provides the initial information about the wide spectrum of complex CHD at high altitude. This combined with high mortality, indicates the urgent need for the implementation of routine echocardiography at NICU and follow-up program in high altitude regions.