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Editorial

Congenital Heart Disease and Autism Spectrum Disorders; Trapping both the Heart and Brain

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With the advent of various medical treatments and cardiothoracic intervention strategies, the survival of infants suffering from congenital heart diseases (CHD) has bolstered up over the last few decades [1]. This has led to the understanding of various other comorbid factors that accompany CHD like neurodevelopmental disorders, atypical development, behavioral difficulties, language and social-cognitive deficits and academic underachievement [2,3]. American Heart Association has also stated that assessment and treatment of neurodevelopmental outcomes in infants with congenital cardiac defects is of prime importance. They also highlighted the increased risk for autism spectrum disorders (ASD) in children with CHD and identified the need for early screening [3].

In a case control study Sigmon., et al. discovered that kids with congenital heart diseases are 32 percent more prone to suffer from autism spectrum disorders than their healthy peers. This outcome was found to be more remarkable in the children with Atrial and Ventricular Septal Defects [4]. In another study it was observed that the risk associated with the screening status in children with autism spectrum disorder was greater than anticipated from population rates. They emphasized that such children must be referred to an expert for assessing the coexistence of social and communication deficits associated with CHD [2]. Likewise, a study conducted in Taiwan demonstrated the effect of congenital heart disease (CHD) on the development of autism spectrum disorder (ASD). Their research proposed that congenital heart defects identified at birth and early developmental disorders EDD identified during infancy are the risk factors predicting development of ASD in later life [5].

Various studies have suggested the underlying elements that might be responsible for establishing a link between ASD and CHD. Children with CHD present with unusual hemodynamic alterations which may lead to compromised cerebral blood flow and consequently an anomalous neurodevelopment as well as dysregulation of Immune system which has been associated with the development of ASD [6-9]. Children with congenital heart defects are likely to have weak brain circuitry. For this reason, children have to scuffle with neurodevelopmental disorders that may influence their executive functions, social behavior, learning and motor functions.

Moreover, research suggests that the connection between heart defects and autism may be genetic. An overlap between genes linked to autism and those linked to congenital heart disease have been found. Zaidi., et al. in their research aimed at identifying detrimental and spontaneous mutations in children afflicted with congenital cardiac defects. Interestingly, they established that majority of the children with these mutations also have other neurodevelopmental disabilities or birth defects.

Homsy., et al. in his research exhibited the existence of shared genetic origin of congenital cardiac defects and neurodevelopmental disabilities. It was found that genes that were highly expressed in heart had a higher expression in brain too. These overlapping genes were found to have de novo mutations in children with NDD and other congenital anomalies. Such mutations alter genes involved in transcriptional regulation, chromatin modification and morphogenesis [10]. Findings of this study proposed that the chromatin modifier genes play a dual part in regulating the development of the heart and brain. Abnormal regulation of genes that play a dual function in human development can lead to cardiac anomalies and neurocognitive disorders. Irrespective of the precise role of these genes, genetic mutations that can dysregulate heart function may have larger manifestations effecting other systems too. Genetic mutations manifest clinical implications as well. It may help pediatricians and parents to get vigilant and observant to identify and manage the risk factors as early as possible. It may help them to identify the risks associated with subsequent pregnancies as well, which may aid them in planning

the family. The most efficient tool for detecting genetic variants leading to congenital anomalies is whole genome-sequencing. This may help in formulating the short and long term management plan of the child suffering from CHD associated with ASD.

The coexistence of congenital heart defects and neurodevelopmental disorders persists to be a matter of concern throughout the life of an individual. The adverse manifestations of CHD and ASD in infancy may continue to exist or even deteriorate in adult life, possibly aggravating the risk of early neurocognitive decline. Protocols should be devised and implemented for the evaluation and screening of children with CHD for ASD. This will help the pediatricians and pediatric cardiologists to devise adequate strategies for neurodevelopmental tracking and ASD screening in infants with congenital heart diseases. It will also enable them to counsel relatives about the expected course of development for children with CHD. Neurodevelopmental aftermaths of CHD must be discussed with the family during antenatal visits. Families of the newborns in need of cardiac surgery should be made aware that the risk of neurodevelopmental impairment is 2 - 3 times greater in infants with CHD in comparison with the children without CHD. Further research regarding causal mechanisms may help the pediatricians to develop appropriate treatment modalities accordingly.

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