

# Congenital Heart Diseases in Adults: A Review of Echocardiogram Records in Enugu, South-East Nigeria

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## Abstract

**Background:** Congenital abnormalities of the heart and cardiovascular system are reported in almost 1% of live births, and about half of these children need medical or surgical help in infancy. In the first decade, a further 25% require surgery to maintain or improve their life. Only 10% survive to adolescence without treatment. Of these 10%, however, many live a normal life for years before their abnormality is discovered. **Aim:** The aim of this study was to find the most common congenital heart diseases in adults presenting for echocardiographic examination in Enugu, and to determine whether there are any gender differences in frequency. **Materials and Methods:** The consecutive echocardiogram reports of 5058 adults done over a period of 9 years (2003-2012) were retrospectively reviewed. All adults who had congenital anomaly on transthoracic echocardiography were included in the study. **Results:** Congenital heart diseases were found in 115 adults representing 2.5% of the adult population (115/4539). The most common congenital anomalies were ventricular septal defects (VSD) - 31.3%, (36/115), atrial septal defects - 28.7% (33/115) and tetralogy of fallot - 10.4% (12/115). **Conclusion:** VSD are the most common congenital heart diseases in adults presenting for echocardiographic examination in Enugu, Nigeria.

**Keywords:** Adults, Congenital heart diseases, Echocardiography, Nigeria

## Introduction

Congenital abnormalities of the heart and cardiovascular system are reported in almost 1% of live births, and about half of these children need medical or surgical help in infancy.<sup>[1]</sup> In the first decade, a further 25% require surgery to maintain or improve their life.<sup>[1]</sup> Only 10% survive to adolescence without treatment. Of these 10%, however, many live a normal life for years before their abnormality is discovered.<sup>[1]</sup> Currently, approximately 150,000 adults with significant congenital heart anomalies live in Germany.<sup>[2]</sup>

Based on a conservative prevalence at birth of 7.0/1000 live births, approximately 14,000 adult patients with congenital heart defects between 16 and 64 years are alive

in Norway today and in need of specialized cardiology attention.<sup>[3]</sup>

In Japan, there has been an estimated increase of 9000 adults with congenital heart disease every year from 1997 to 2007. In 2007, about 409,101 adults with congenital heart disease are estimated to be alive in Japan.<sup>[4]</sup> About 500,000 patients in the USA alone have survived into adulthood with congenital heart disease with about 20,000 additional patients reaching adulthood each year.<sup>[5,6]</sup>

Previous studies in sub-Saharan Africa had documented prevalence rates of 3.9/1000 and 2.3/1000 school children.<sup>[7,8]</sup> In a similar study done more than a decade ago at Enugu, 13.2% of all patients who presented for echocardiographic examination had congenital heart diseases.<sup>[9]</sup> The authors are not aware of any study on congenital heart diseases in adults in this environment, which made this study necessary.

The authors set out to find the most common congenital heart diseases in adults presenting for echocardiographic examination in Enugu, and to determine whether there are any gender differences in frequency.

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## Materials and Methods

The University of Nigeria Teaching Hospital (UNTH) Enugu, Enugu State is a 500 - bed tertiary hospital in South-East Nigeria. Within the period under review, it provided echocardiographic services for about 20 million Nigerians in the South East region. Although many new centers currently offer echocardiographic services, the UNTH remains a referral center for other tertiary institutions in South-East Nigeria. The hospital is designated the cardiothoracic center of excellence in Nigeria and was the only center in Nigeria providing cardiac surgeries routinely up to the year 2005.

Conquest Medical Imaging Limited is a private medical diagnostic center in Enugu, which offers diagnostic radiologic and ultrasonographic services.

Redemption Clinic is a private cardiology clinic in Enugu that offers clinical and echocardiographic services.

The consecutive echocardiogram reports of 1890 adults done over a period of 8 years at the UNTH (May 2003 to Jan 2012), and 924 adults done over a period of 3 years at Conquest Medical Imaging (July 2009 to July 2012) as well as that of 1725 adults done over a period of 4 years at Redemption Clinic (February 2008 to July 2012) were retrospectively reviewed.

All adults (aged 18 years and above) who had a congenital anomaly on transthoracic echocardiography) were included in the study.

Echocardiography was done with either a Hewlett Packard SONOS 2000 echocardiographic machine equipped with a 3.7 MHz transducer for adults, a video recorder and printout processor, a Sonoscape SSI 5000 echocardiographic machine or Logic 500MD echocardiographic machine. The machines have capabilities to perform M-mode, two-dimensional, and Doppler examinations. The echocardiographic examinations were performed and interpreted by three cardiologists.

All measurements were taken from standard echocardiographic views according to the recommendation of the American Society of Echocardiography.<sup>[10]</sup>

Data obtained from the echo register included age, gender, clinical diagnosis, and specific congenital anomaly. Data obtained were analyzed with a computer using SPSS version 15 software (Chicago, USA). Data were presented as mean (standard deviation) for continuous variables and frequency/percentages for discrete variables. Differences between groups (male and female) were compared with Student's *t*-test for continuous variables and Chi-squared with Fisher's exact test (when appropriate) for discrete variables. Statistical values with probabilities <0.05 were considered as significant.

## Results

There were 5058 new echocardiogram reports over the period of review, comprising 519 children and 4539 adults. The adults were made up of 2587 males (57%) and 1952 females (43%). Congenital heart diseases were found in 2.5% of the adult population (115/4539) [Table 1].

The age range of adults with congenital heart diseases was from 18 to 84 years, mean 32.31 (15.26) years, and consisted of 60 females (52%) and 55 males (48%).

These figures show that 3% of all the females (60/1952), and 2% of all the males (55/2587) in this study had congenital heart disease. The mean age of the males was 33.16 (16.72) years, while the mean age of the females was 31.52 (13.88) years. There was no statistically significant difference between the ages of males and females [Table 1].

Of these congenital anomalies, 67 were of simple severity, 48 were of moderate complexity, while 3 were of great complexity.

The most common congenital anomalies were ventricular septal defects (VSD) - 31.3% (36/115), atrial septal defects (ASD) - 28.7% (33/115) and tetralogy of fallot (TOF) - 10.4% (12/115).

Atrial septal defects and persistent ductus arteriosus were more prevalent in females, while TOF was more prevalent in males. However, only difference in the frequency of ASD was statistically significant [Table 2].

All the three cases of dextrocardia were noted in males, while the three cases of common atrio-ventricular canal were noted in females [Table 2].

## Discussion

This study has shown that 2.5% of adults who present for echocardiographic examination have congenital heart diseases. There was no statistically significant difference in the mean ages of males and females affected by the different congenital heart diseases, or in the frequency between both genders. This

**Table 1: Age and gender distribution of patients**

Age group (years)	Frequency (%)			$\chi^2$	P value
	Male n=55	Female n=60	Total n=115		
18-30	32 (27.83)	37 (31.17)	69 (60.00)	2.408	0.661
31-40	9 (7.83)	6 (5.22)	15 (13.04)		
41-50	7 (6.09)	12 (10.43)	19 (16.52)		
51-60	4 (3.48)	3 (2.61)	7 (6.09)		
61 and above	3 (2.61)	2 (1.74)	5 (3.35)		
Mean age (years±SD)	33.16 (16.72)	31.52 (13.88)	32.31 (15.26)	0.571 <sup>a</sup>	0.569 <sup>a</sup>

SD: Standard deviation

**Table 2: Gender distribution of congenital anomalies**

Congenital abnormalities	Males	Females	Total	Percentage	$\chi^2$	P value
Ventricular septal defects	19	17	36	31.3	0.267	0.6056
Atrial septal defects	10	23	33	28.7	4.753	0.0293*
Tetralogy of Fallot	9	3	12	10.4		0.0664 <sup>a</sup>
Partial atrio-ventricular canal	4	3	7	6.3		0.7080 <sup>a</sup>
Persistent ductus arteriosus	1	5	6	5.2		0.2090 <sup>a</sup>
Aortic stenosis (supravalvular and subvalvular)	3	1	4	3.4		0.3476 <sup>a</sup>
Pulmonary stenosis	2	2	4	3.4		1.0000 <sup>a</sup>
Dextrocardia	3	0	3	2.6		0.1063 <sup>a</sup>
Common atrio-ventricular canal	0	3	3	2.6		0.2485 <sup>a</sup>
Cor triatriatum	0	2	2	1.7		0.4966 <sup>a</sup>
Ebstein's anomaly	1	0	1	0.9		0.4783 <sup>a</sup>
Tricuspid atresia	1	0	1	0.9		0.4783 <sup>a</sup>
Patent foramen ovale	1	0	1	0.9		0.4783 <sup>a</sup>
Pulmonary vein stenosis	0	1	1	0.9		1.0000 <sup>a</sup>
Bicuspid aortic valve	1	0	1	0.9		0.4783 <sup>a</sup>
Total	55	60	115	100		

\*Statistically significant, <sup>a</sup>Fisher's exact test

contrasts with the result of another study done on adults with congenital heart diseases where females had higher frequencies and were older than males.<sup>[11]</sup> VSD, ASDs, and TOF, in that order, were the most common congenital abnormalities seen in adults in this study.

Our findings are similar to similar studies done elsewhere,<sup>[12]</sup> and also parallel similar studies done in the general population in our environment.<sup>[9,13]</sup> The study also showed that about 73% of adults with congenital heart diseases are below the age of 40 years. This may be a pointer to the high level of mortality associated with these abnormalities in the absence of surgical correction in childhood, since most patients with congenital heart diseases fail to reach middle age in our environment. It also underscores the need for concerted efforts to be made by relevant agencies to ensure that cardiac surgical services are available and affordable to the large population of Nigerian patients with congenital heart diseases.

Atrial septal defects were significantly more prevalent in females in this study, and this finding has been documented both in children and adults by previous studies.<sup>[11,14]</sup> TOF was more frequent in males with a male to female ratio of 3:1, though the difference was not statistically significant. Varying results have been documented in the past by different researchers on the gender differences in the prevalence of TOF.<sup>[15,16]</sup> Persistent ductus arteriosus was also more frequent in females, but the difference was not statistically significant, and this is similar to the findings of some other researchers in the past.<sup>[11]</sup> It is noteworthy that bicuspid aortic valve was found only in one patient in this study. Sani *et al.*, had also made a similar observation in a study done in Kano in Northern Nigeria.<sup>[13]</sup>

## Conclusion

Ventricular septal defect and ASD are the commonest congenital heart abnormalities found in adults in Enugu,

South-East Nigeria. ASD is more common in females than in males.

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