Role of fetal echocardiography in improving outcome of neonate with congenital heart diseases

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Abstract: Congenital heart diseases (CHD) are the most common type of congenital anomalies and are a leading cause of mortality among children with congenital malformations. The estimated incidence of CHD is 8/1000 live birth. The aim of this study was to know the incidence of congenital heart disease among live born babies delivered at Aljala maternity hospital in Tripoli during 2009 and to compare the outcome of those diagnosed prenatally (via fetal echocardiography) with those discovered postnatally. The study involved 101 infants delivered in Aljala maternity hospital during January and December, 2009, who were diagnosed to have congenital heart defects. The results revealed that the incidence of CHD is 7 per 1000 live births. There is no sex predilection as the M : F ratio is 1.06 : 0.94 and positive family history of CHD increase the risk by only 2%. Septal lesion (VSD and ASD) found in 34% of the patients, 57% have mixed type of lesion while 5% have complex heart diseases, the number of lesion affects the outcomes of patients significantly. Among 101 total patient, 14 patients (14%) need surgical treatment, 26 patient (26%) received medical treatment, while 61 patients (60%) just followed up in cardiac clinic. Prenatal diagnosis of CHD is of value in improving management of patients with congenital cardiac anomalies although the relation between antenatal diagnosis and outcome, statistically not significant. Depending on the results of this study, a national screening program for congenital heart disease via the 5- views obstetrical ultrasound examination of pregnant ladies at 16 - 20 weeks of gestation is recommended (as first step in prenatal diagnosis) and long term prospective studies are needed to further evaluate the role of prenatal diagnosis in improving prognosis of patients with congenital heart disease.

Keywords: neonates CHD, congenital malformations, fetal echocardiography,Libya.

Introduction

Congenital heart disease (CHD) refers to a problem with heart structure and function due to abnormal heart development before birth. In the definition by Mitchell et al. (1) congenital heart disease is a gross structural abnormality of the heart or intrathoracic great vessels that is actually or potentially of functional significance. It is the most common birth defects, occurring approximately in 8 per 1000 live births with higher incidence in premature infants (2%) (2). Higher incidence shown in many recent studies (reaching 12 per 1000 live births or higher) (3). This is largely attributed to the increasing use of echocardiography in diagnosing congenital cardiac defects including the expanding role of antenatal diagnosis via fetal echocardiography, which is a non-invasive diagnostic ultrasound test that can detect congenital heart defects and

rhythm disturbances in the fetus; the optimal timing is 18 to 22 weeks gestation (4). The aim of our study to find out the incidence of congenital heart diseases among infants delivered in the Aljala maternity hospital and to compare the outcome of infants with congenital heart diseases diagnosed antenatally (via fetal echocardiography) with those diagnosed postnatally. It is descriptive study conducted in Aljala maternity hospital and the cardiology outpatient clinic in Tripoli children hospital was reviewing the medical records of patients over one year period of 2009.

Figure 1: Distribution of the patients according to time of diagnosis.

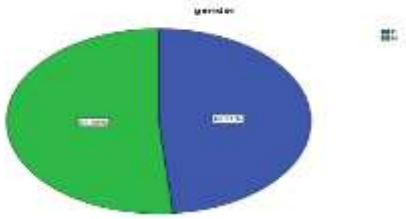

Figure 2: Sex distribution of patients with congenital heart disease.

Results and discussion

The total live births in Aljala maternity hospital from January 1, 2009 to December 3, 2009 are 14617 newborn, out of which 101 new born babies diagnosed to have congenital heart disease with an incidence of 7 per 1000 live births, which is between the recorded international figure 8/1000 live births, and the figure recorded by the health region in England 6.5/1000 live births (5). The highest incidence recorded in Taiwan between 2000-2006, where it was 13.1/1000 live births (6). Only forty of patients were diagnosed antenatal by doing fetal echocardiography, while 61 patients (60%) did not do fetal echocar-diography and diagnosed during neonatal period (figure 1). There is no sex predilection as the percentage of male patients was (51.49%) while female patients (48.51%) with male to female ratio 1.06 : 0.94, almost 1 : 1, figure (2).

We record 9% of the patients has family history of CHD, two of them their sibling are affected that will increase the risk to only 2%. This is lower than the usual risk factor when sibling is affected which is 4%, while 91% of patients have negative family history for the disease, figure 3.

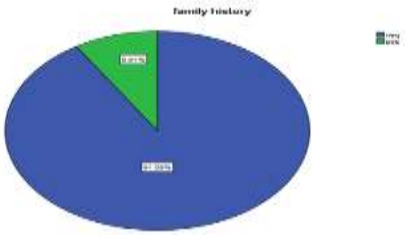

Figure 3: Distribution of patients with CHD according to family history of the disease.

By analyzing the antenatal history we found 57% of patient's their mothers with no relevant antenatal history, 2% their mothers

have TORCH infection. While 41% of patients are infants of diabetic mothers, the high percentage of diabetic mothers is largely because the diabetic clinic in this hospital is the main referral center in Tripoli and surrounding area. It is known that diabetes mellitus increase the risk of CHD by 3%, in our study the risk increased to 7% as 41 out of 567 infants of diabetic mothers delivered in the hospital during the year 2009 were diagnosed to have CHD, which is higher than the figure recorded in study done in Canada between 2002-2010, were the risk of CHD to infant of diabetic mothers increased to 4.38% (7). Most of patients were full term babies (85%), while (15%) were preterm babies, it is similar to the result of study done in England from 1987 to 2001, they found that preterm babies constitute 16% of patients with Congenital heart disease (8). 60% of those preterm patients were infants of diabetic mothers, in our study 60% of preterm neonates having patent ductus arteriosus (PDA) which is the commonest congenital heart lesion found in preterm babies. Regarding the type of CHD, 34% of patients were found to have septal lesions; ventricular septal defect (VSD) account 3/1000 live birth, Atrial septal defect (ASD) 1.5/1000 live birth, while 2% of patients having valvular lesions (mitral and tricuspid regurgitation, pulmonary stenosis), another 2% with arterial lesions (patent ductus arteriosus , coarctation of aorta). Those with mixed type of lesions constitute 57% of patients and 5% have complex heart disease which account only 0.3% per 1000 live birth, table 1.

Table 1: Distribution of patients according to group of lesions (type of CHD)

	Frequency	Percent
septal lesions	34	33.7
valvular lesions	2	2.0
Arterial lesions	2	2.0
Septal& valvular lesions	8	7.9
Septal & arterial lesions	30	29.7
valvular & arterial lesions	3	3.0
septal ,valvular& arterial lesions	17	16.8
complex heart disease	5	5.0
Total	101	100.0

This figures is similar to the result in a population based study from Atlanta, USA (1998-2005), the commonest lesions being VSD, ASD, Tetrology of fallot (3.8, 1 and 0.5 per 1000 live births), respectively (9). Among 101 total patients, 14 patients (14%) were treated by surgery, 26 patients (26%) received medical treatment (drugs), while 61 of patients (60%) were just followed up in the cardiac clinic, figure (4). The outcome were 87 patients got improved (86%), 6 were not improved (6%) and 8 patients died (8%), figure 5.

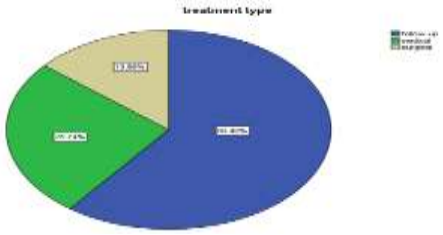

Figure 4: Distribution of patients according to type of management

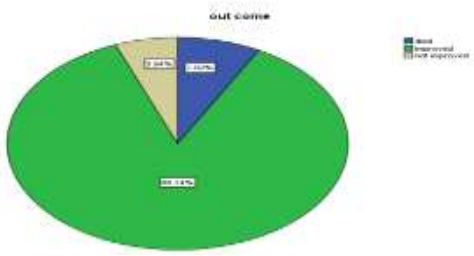

Figure 5: Distribution of patients with CHD according to overall outcome.

We found that the gender does not affect the outcome as the number of deaths and non-improvements is equal in both males and females, $p = 0.993$ by using X^2 test. The high percentage of non-improvement among preterm babies (20%) compared to full term babies (3.5%) is largely attributed to the fragility of preterm babies making them vulnerable to complications and multiple health problems even with proper intervention (out of 3 preterm babies treated by surgery, 2 were not improved; compared to 11 full term babies treated by surgery only 1 patient not improved and one died postoperatively), the $p = 0.044$, which is statistically relevant and means there is strong relation between gestational age and outcome of surgical treatment, table 2.

Table 2: Relation between gestational age and outcome.

			GA		Total
			FT	PT	
Out come	died	Count	7	1	8
		% within GA	8.1%	6.7%	7.9%
	Improved	Count	76	11	87
		% within GA	88.4%	73.3%	86.1%
	not improved	Count	3	3	6
		% within GA	3.5%	20.0%	5.9%
	Total	Count	86	15	101
		% within GA	100.0%	100.0%	100.0%

But when we study the relation between the number of lesions and the outcome of patients the results are less promising, going down from 100% improvement in case of single lesions to 50% improvement in patients with 5 lesions. The p = 0.002, which statistically significant, table 3. By comparing the relation between the anti-natal diagnosis and the outcome we found that Out of 8 total deaths, 6 patients (75%) were not diagnosed antenatally by fetal echocardiography, while in 2 patients (25% of deaths) fetal echocardiography was done (antenatally diagnosed) and out of 6 patients were not improved; 5 (83%) did not do fetal echocardiography compared to one patient (17%) who did fetal echocardiography and diagnosed antenatally.

By applying the statistical tests the p = 0.310 which means there is no statistical significant relation between antenatal diagnosis and outcome, table 4. In our study, 61 patients were did not receive any form of treatment (just follow-up); among them 60 got improved (98%) and one patient died (2%). While 26 patients were treated medically (drugs); out of them 17 (65%) got improved, 6 (23%) patients died, and 3 (12%) patients not improved. 14 patients were treated by surgery; 10 (72%) patients of them got improved, one patient died (7%) and 3 (21%) not improved. By applying X^2 test p = 0.000 (highly significant) which means there is relation between type of treatment and outcome, table 5.

Table 3: Relation between numbers of lesions and patients outcome.

		outcome			
		died	improved	not improved	Total
number of lesions	1 lesion	0	17	0	17
		.0%	100.0%	.0%	100.0%
	2 lesions	2	36	0	38
		5.3%	94.7%	.0%	100.0%
	3 lesions	2	23	1	26
		7.7%	88.5%	3.8%	100.0%
	4 lesions	3	9	4	16
		18.8%	56.3%	25.0%	100.0%
	5 lesions	1	2	1	4
		25.0%	50.0%	25.0%	100.0%
Total		8	87	6	101
		7.9%	86.1%	5.9%	100.0%

Table 4: Relation between Antenatal diagnosis and Outcome.

			fetal ECHO		
			not done	done	Total
outcome	died	Count	6	2	8
		% within outcome	75.0%	25.0%	100.0%
	improved	Count	50	37	87
		% within outcome	57.5%	42.5%	100.0%
	not improved	Count	5	1	6
		% within outcome	83.3%	16.7%	100.0%
Total		Count	61	40	101
		% within outcome	60.4%	39.6%	100.0%

Table 5: Relation between treatment type and outcome

			out come			
			died	improved	not improved	Total
treatment type	follow up	Count	1	60	0	61
		% within treatment type	1.6%	98.4%	.0%	100.0%
	medical	Count	6	17	3	26
		% within treatment type	23.1%	65.4%	11.5%	100.0%
	surgical	Count	1	10	3	14
		% within treatment type	7.1%	71.4%	21.4%	100.0%
Total		Count	8	87	6	101
		% within treatment type	7.9%	86.1%	5.9%	100.0%

In conclusion: The incidence of congenital heart diseases among life born babies delivered in Aljala maternity hospital in the year 2009 was similar to the international incidence of the disease (7 versus 8 per 1000 live births). Septal lesion (VSD and ASD) is the most common CHD as it is found in 34% of patient. Prenatal diagnosis of CHD is of value in improving management of patients with congenital cardiac anomalies although the relation between antenatal diagnosis and outcome.

References

1. Mitchell SC, Koronos SB, Berendes HW (1971) Congenital heart disease in 56.190 live births, Incidence and natural history. Circulation. 43: 323-332.
2. Kliegman RM, Behrman RE and Stanton J (2007) Congenital heart disease: Nelson text book of pediatrics, disease of the cardiovascular system,18[18] Edition 2007;1878.
3. Hoffman JIE (1995) Incidence of congenital heart diseases post natal incidence. Pediatric Cardiol. 16: 103-113.
4. Alrabte H, Sultan M, Abied N. and Dekna M (2009) Sensitivity and specificity of fetal echocardiography in diabetic mothers. Jam. Med J. 9(2): 102.
5. Wren C, Reinhardt Z, Khawajak K. (2008) Twenty year trends in diagnosis of life threatening neonatal cardiovascular malformations. Arch Dis Child Fetal Neonatal. 93: f33.
6. Wu MH, Chen HC, Lu CW, et al. (2010) Prevalence of congenital heart disease at live birth in Taiwan. J pediatr.156: 782.
7. Liu S, Joseph KS, Lisonkova S, etal. (2013) Association between maternal chronic conditions and congenital heart defects; a population based study. Circulation 128: 583.
8. Tanner K, Sabrine N, Wren C. (2005) Cardiovascular malformations among preterm infants. Pediatrics. 16: e833.
9. Reller MD, Strickland MJ, Riehle Colarusso T et al. (2008) Prevalence of congenital heart disease in metropolitan Atlanta. 1998-2005.J Pediatr. 153: 807.