ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY981

Clinical Profile and Natural History of Children with Ventricular Septal Defects in Tripoli, Libya from 1996 through 2009

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Abstract:- Introduction and Objectives: Ventricular septal defect (VSD) is the most common congenital heart diseases, it accounts 40%. This study carried out to describe the epidemiological characters and clinical presentation of patients with VSD in Western and Southern Libya, and to evaluate spontaneous versus surgical closure in different types.

➢ ***Patients and Methods***

It is hospital case series study conducted by reviewing the medical records of 1092 patients followed at cardiology outpatient department (OPD) of Tripoli Children Hospital from 1996 through 2009, the data abstracted from medical records and filed in a worked sheet, Excel and SPSS software used to analyze the data.

➢ ***Results***

We identified 1092 patients. The results revealed that 30.9% diagnosed during the first month, and 49.7% from1 to 12 months. From 1092 patients; 50.8% have peri-membranous VSD, 18.8% muscular, and 13% having an apical type. 97.2% of males have peri-membranous VSD where muscular and apical seen more in female, p value = 0.001. Cardiac murmur is the common presenting sign 61.3%, 9.3% have feature of Down syndrome. Positive Family history of CHD in 9.9% with significant relationship between family history and type of VSD (peri-membranous type), P value = 0.001. Small VSDs accounts 66.9%, large VSDs 16.1%, followed by medium size VSD 11.8% of cases. Patients with large VSDs more prone for hospital admission as 101 (57.4%) from 176 patients were admitted to hospital, followed by moderate size (45%), P value = 0.001. 70.3% of patients with large VSD need either medical or surgical treatment, P value = 0.001. Spontaneous closure seen in 17%, 0.6% died, while 41.9% still on follow up. Muscular VSD shows the highest tendency for spontaneous closer as 72% closed by the age of 2 years.

➢ ***Conclusion***

We conclude that peri- membranous VSD is the most common type. Two thirds of patients had been diagnosed in the first year of life. Big defects and some of moderate VSDs need either medical or surgical treatment. Spontaneous closer is usually seen in the first 2 years of life.

➢ ***Recommendations***

We highly recommend for further multi-center study all over the country to get reliable data on the prevalence of congenital heart diseases and the incidence of ventricular septal defect in our population.

Keywords:- *Epidemiology, Infant, Children, Ventricular Septal Defect, Libya.*

I. INTRODUCTION

Ventricular septal defect (VSD) is the most common congenital heart defect accounting for 40 % of all congenital heart defects (CHD) [1], and isolated VSD accounts for more than 20% of all CHD [2]. The magnitude of the shunt depends on defect size and downstream resistance (i.e., pulmonary outflow tract obstruction and pulmonary vascular resistance). Blood flows easily across larger defects, which are thus called non-restrictive; pressure equalizes between the right and left ventricles and there is a large left-to-right shunt. Assuming there is no pulmonic stenosis, over time, a large shunt causes pulmonary artery hypertension, elevated pulmonary artery vascular resistance, right ventricular pressure overload, and right ventricular hypertrophy. Ultimately, the increased pulmonary vascular resistance causes shunt direction to reverse (from the right to the left ventricle), leading to Eisenmenger`s syndrome [1,2,3]. Smaller defects referred to as restrictive VSD where the pulmonary artery pressure is normal or minimally elevated. Moderate VSDs result in intermediate manifestations [1,2,3].

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY981

The diagnosis of ventricular septal defect is suggested by clinical examination, supported by chest x-ray, ECG, and echocardiography study will establish the diagnosis and provide anatomic and hemodynamic information, including the defect's location, size and right ventricular pressure. Cardiac catheterization is rarely necessary for diagnosis [1]. The VSD is classified according to its relation to septum as inlet, trabecular, outlet, and membranous Type [4]. Another classification is based on VSD location on the right surface of the inter-ventricular septum as single or multiple, infundibular, peri-membranous, inlet, muscular, and Gerbode defect [5].

Children with small asymptomatic defects need no medical management and are unlikely to need intervention. First-line treatment for moderate or large defects affecting feeding and growth is with medical treatment for heart failure and high-energy feeds to improve calorie intake. Any patient needing significant medical management should be referred for surgical assessment [6]. Yet surgical closure has been performed with low perioperative mortality and a high closure rate [7,8]. Nowadays, successful Trans-catheter device closure of muscular and peri-membranous VSDs has been performed with excellent closure rates and a low procedural mortality [9–12]. This study has been conducted to evaluate the epidemiological data with natural and modified history of isolated ventricular septal defects in pediatrics age group in Libyan populations.

II. PATIENTS AND METHOD

This study conducted on children diagnosed and followed from 1996 to the end of 2009 as ventricular septal defects (1092 cases). Those followed in cardiac outpatient department (OPD) at Tripoli children hospital that provides medical services to children from birth up to 16 years old coming from inside Tripoli and most of west and south of Libya. The inclusion criteria are clinical and/or echocardiography evidence for isolated VSD, VSD+PS, VSD+ASD, VSD+PDA, while the exclusion criteria: Any VSD with other than mentioned defects. The data abstracted from the medical records (retrospective study), and filed in a work sheet including; Sociodemographic characteristic of the patients (Age at presentation, Sex, and Address), Place of refer, Cause of refer (murmur, heart failure, chest infection, FTT & other congenital anomalies). Family history of congenital heart disease; if present or not. The VSDs were divided according to location as (peri-membranous, muscular, Swiss cheese, marginal, & apical), according to size as (Small, moderate or big) and associated lesions (PS, ASD, and PDA). History of hospital admission, type of treatment (Medical, surgical or both) and the finding after 2 years, 5 years follow up was analyzed. All statistical calculations were done using Microsoft Excel version 7 (Microsoft Corporation, Redmond, WA, USA) and SPSS version 23.0 (SPSS, Chicago, IL, USA) statistical programs.

III. RESULTS

The results revealed that one third of patients 337/1092 (30.9%) were diagnosed in the first month of life, while half 543/1092 (50%) were diagnosed by the end of the first year, 133/1092 (12.2%) diagnosed between 1-5 year of age, and only 75/1092 (7%) of cases were diagnosed after the age of 5 years, Figure (1). We observed that VSD has sex predilection as 571/1092 (52%) of cases were male and only 521 (48%) of cases are females with P value = 0.001, table 1 compares our finding to those from Nigeria and Turkey. Nearly half of patients seen in OPD at Tripoli Children Hospital 471/ 1092(44.9%) were referred from the same hospital (Nursery, special care baby unit (SCBU), inpatient including Intensive care unit(ICU) and OPD), 268/1092 (24.5%) from other hospitals, 218/1092 (20%) from privet clinic, and only 37/1092 (3.4%) of cases are referred from polyclinic, Table 2.

The most common cause of refer was a murmur 670/1092 (61.4%), Evaluation of children with Down syndromes account 102/1092 (9.34%), while 113/1092 (10.35%) previously diagnosed and join our OPD for follow up, (6.7%) presented with heart failure, respiratory distress and bronchopneumonia. Most who presented with heart failure and pneumonia had large VSD located in the peremembranous position, Figure (2). Family history of CHD was found in 108/1092 (9.9 %) of cases, and all those patient (108) diagnosed as peremembranous VSD with significant P value= 0.001, Table 3. The most common type of VSD in our study was peri-membranous type, it accounts 555/1092 (50.8%), followed by muscular type 205 (43.3%), and 142 (13%) were have an apical type; Figure 3, this results is comparable with other studies done in Turkey, Nigeria and Arabia Saudi [14, 15, 16].

Regarding the size of VSD two third 731/1092 (67%) of patients have small VSD, 176/1092 (16.1%) large, and 129/1092 (11.8 %) were moderate size VSD, Figure 4. Isolated ventricular septal defect found in 43% of patients, and the most associated lesion is atrial septal defect (ASD) (28.75%). We observed that only 39.9% (436/ 1092) of patients having VSD were admitted to hospital. And the results showed significant relationship between the size of VSD and hospital admission, where we found large VSDs 57.4 % (101/ 176) more common to be admitted to hospital followed by moderate size 45% (58/129), while small size VSD 34.9% (255/731) were admitted for extra cardiac cause, with P value=0.001, Table (4). Also strong relation between the need for either medical, surgical treatment or both to the size of VSD was seen, as 64 cases needed both medical and surgical treatment; of them 45 (70.3%) were of big size lesion, P value=0.001, Table 6.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY981

IV. DISCUSSION

We observed that one third of patients 30.9% diagnosed in the first month of life, another 50 % were diagnosed by the end of one year, and only 12.2 % of patient diagnosed between 1 -5 years. By comparing our data with the results of study done in Jordan were 20.1% of cases diagnosed in the first month of life, 61% of patient by the end of first year, and 38% after the age of one year [13], in our data significantly more males had VSD's than females. This finding is comparable to results of study done in Turkey that show the same result were (53.9%) are male and (46%), [16], while the study that conducted in Nigerian show reversed ratio (57.3%) are female and (42.6%) are male [14], Table (1) .in regards to the place of referral we found only 37/1092 (3.4%) of cases comes from polyclinic; this arise the need to increase the awareness and improve the clinical practice of medical personal at primary health care centers, Table (2). our results are comparable with other studies done in Turkey and Nigeria regarding the frequency of occurrence for the different types of VSDs were peremembranous type have the highest percentage followed by muscular type [14-15], Table (5). Unlike the Nigerian study where Tetralogy of fallout is the most common associated lesion reported in 24.6% of patients; and ASD reported as associated lesion only in (10.9%), our study and the Jordanian shows that the most common associated lesion was ASD which is reported nearly in one third of all combined lesion [13-14]. Patients have large VSD are more prone for hospital admission 57.4% followed by moderate VSD 45 %, Table (4), also strong relationship was observed between the size of VSD and the mode of management as large and moderate VSD needs medical, surgical or both mode of treatment, P value=0.001, Table (6).

After 2 years follow up 186 patients (17%) have spontaneous closer, this percentage is less than what is mentioned in literature as it is stated 45 % of isolated VSD are closed in the first year of life [1,17]. We observed that muscular type VSD have the high possibility of closer as 72% of patient show spontaneous closure have muscular VSD, Figure (5). From 1092 only 80 patients (7.3%) underwent surgical correction of their defect outside our hospital and then return back for follow-up, 7 patients (0.6 %) were died before the surgery, and 458 patients (41.9%) still on regular follow up; 318/458 (69.4%) small size, 79/458 (17.2%) moderate size and 43/458 (9%) of large size, this mean that 122/458 (26.2%) of patients needs surgical repair and have delay in their management, figure (6). By the end of 5 years follow up the number of patient show spontaneous closure raised only to 208 (19%) which prove that the chance of spontaneous closer of VSD is seen naturally in the first 2 years of live, while the number of patients died before surgery increased to 10 (0.92%), Figure (7).

V. CONCLUSION

We conclude that ventricular septal defect seen more frequently in males and peri- membranous VSD is the most common type. Two third of patients had been diagnosed in the first year of life. Most big defects and some of moderate size VSDs need either medical, Surgical or both mode of treatment which need hospital admission; even though still good number of patients did not receive their proper management yet. It was observed that spontaneous closer is usually seen in the first 2 years of life.

RECOMMENDATIONS

We highly recommend for further multi-center studies all over the country in order to get reliable data on the prevalence of congenital heart diseases and the incidence of ventricular septal defect in our population. Also we highly recommend for improving the health services provided for those patient including good training for cardiologist and cardiac surgeons to help those children.

LIMITATIONS

We face some problem including missing of some data, which express the need for electronic file system.

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ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY981

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FIGURES

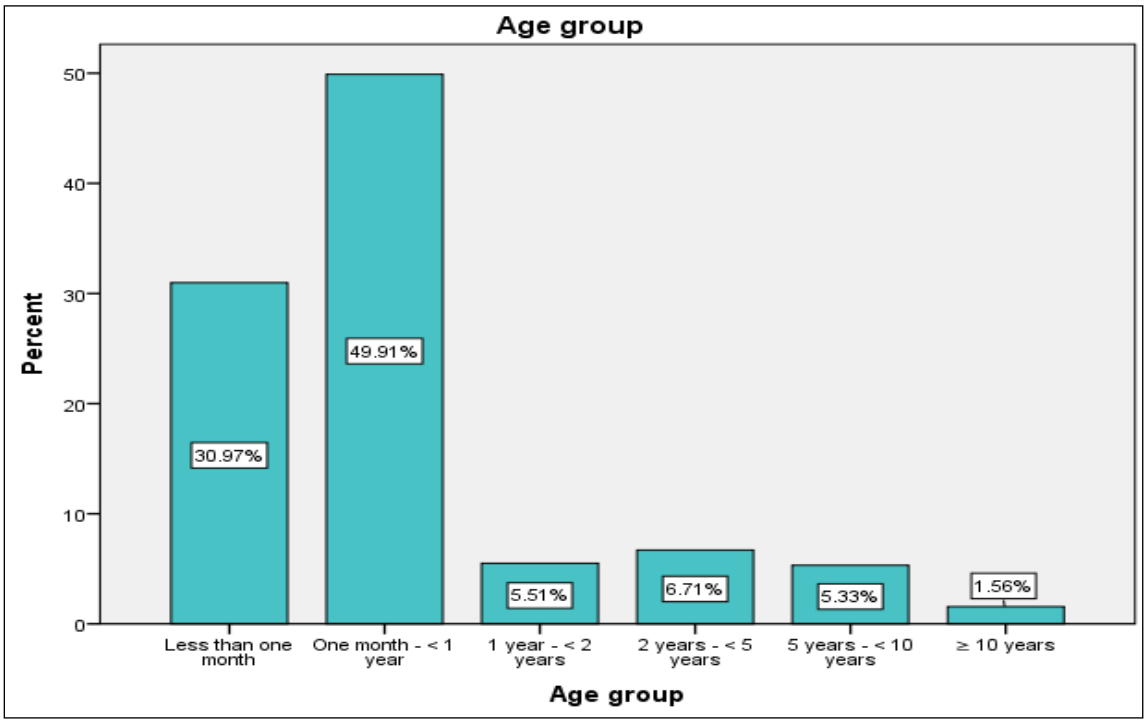

Fig (1): Distribution of Age Group at Time of Diagnosis in the Study.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY981

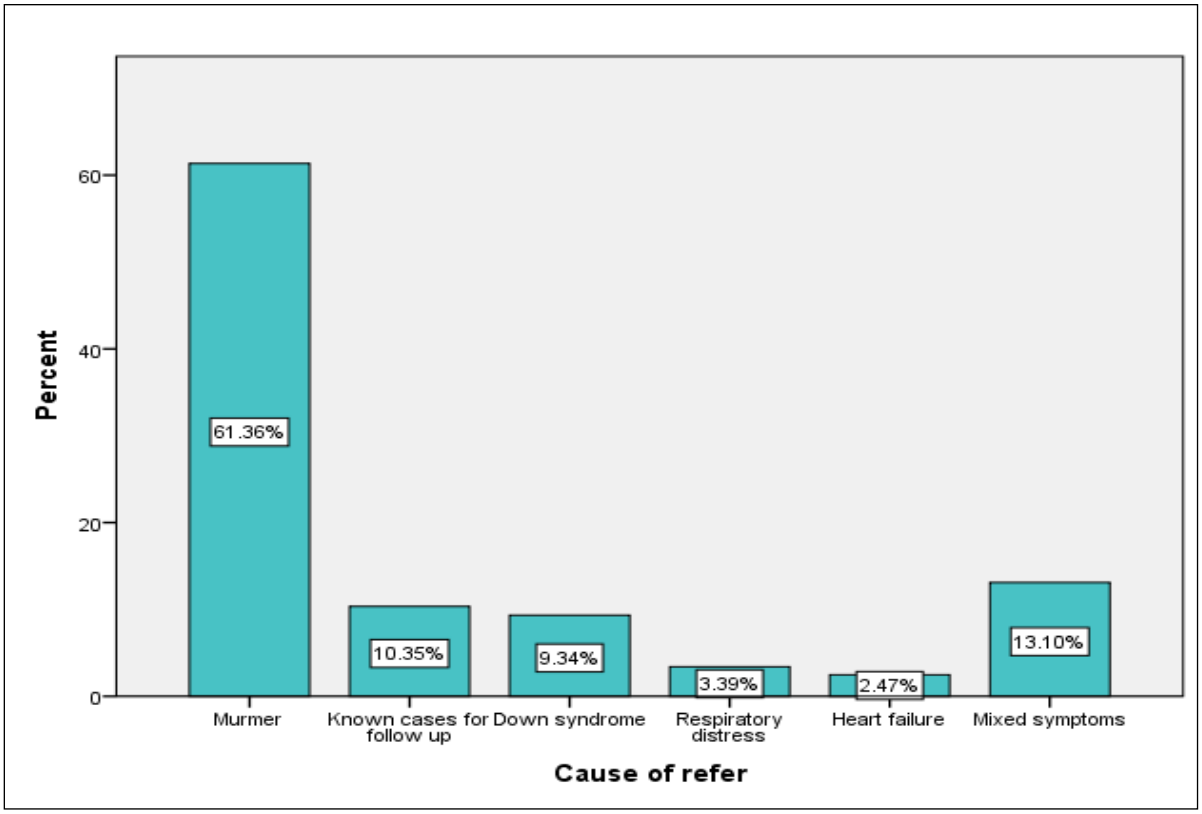

Fig (2): Shows the Presenting Clinical Features in Patients with Ventricular Septal Defect in the Study.

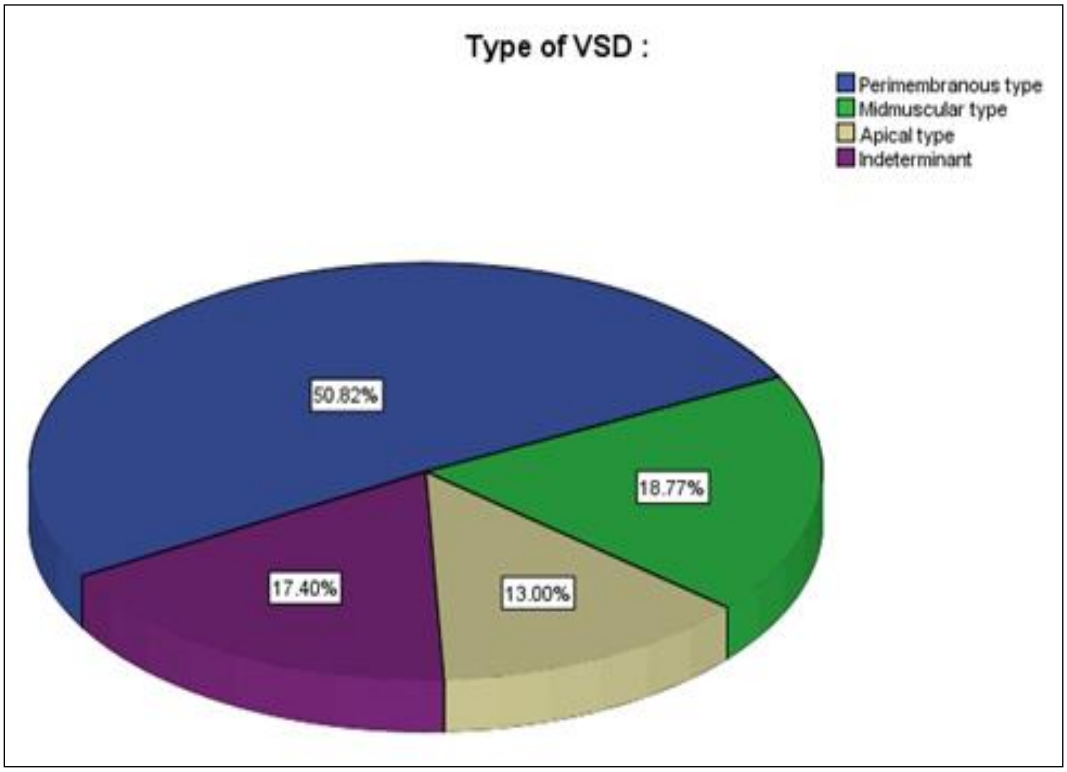

Fig (3): Shows Type of VSD in the Study.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY981

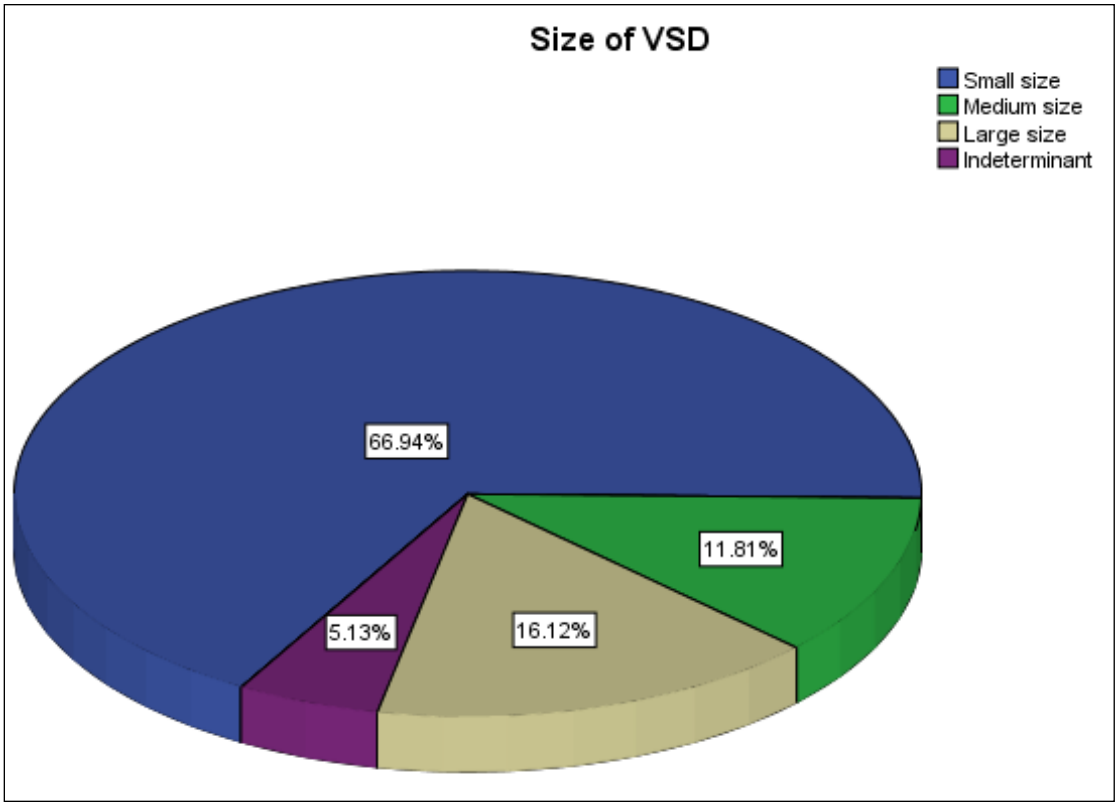

Fig (4): Shows the Percentage of Different VSD Size in the Study.

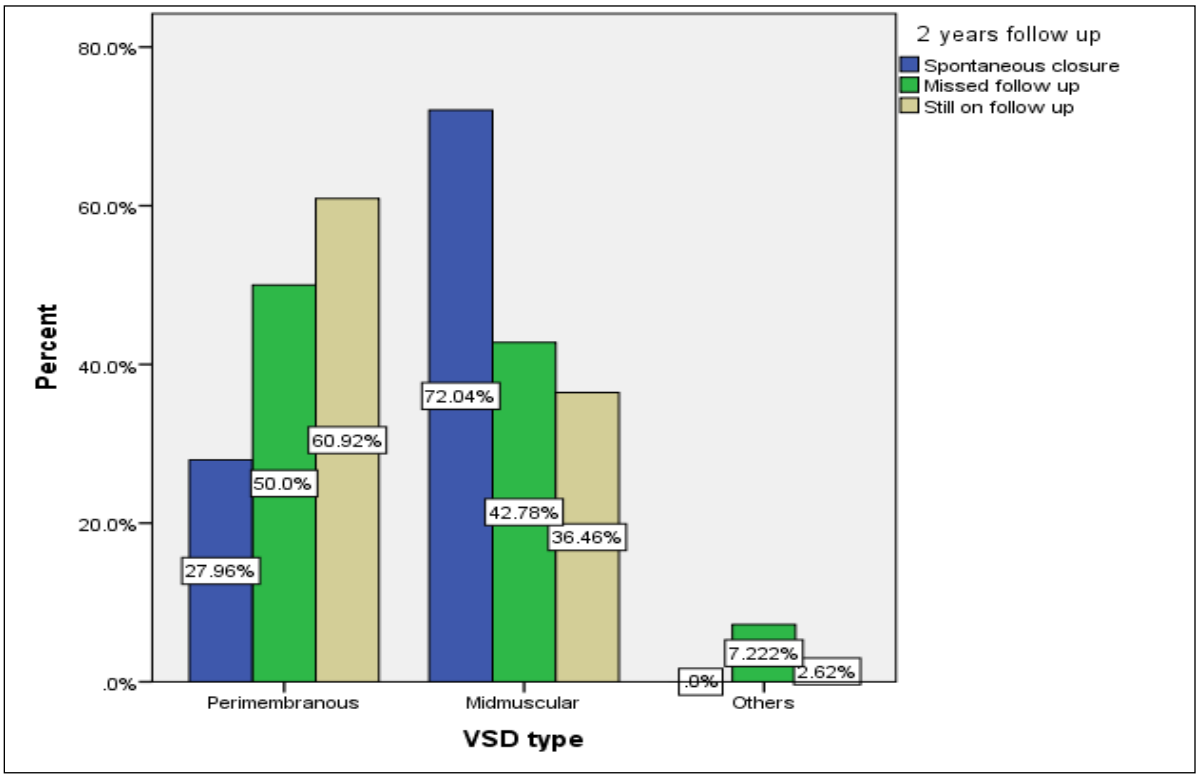

Fig (5): Shows the Outcome of 2 Years Follow Up in Relation with the Type of VSD.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY981

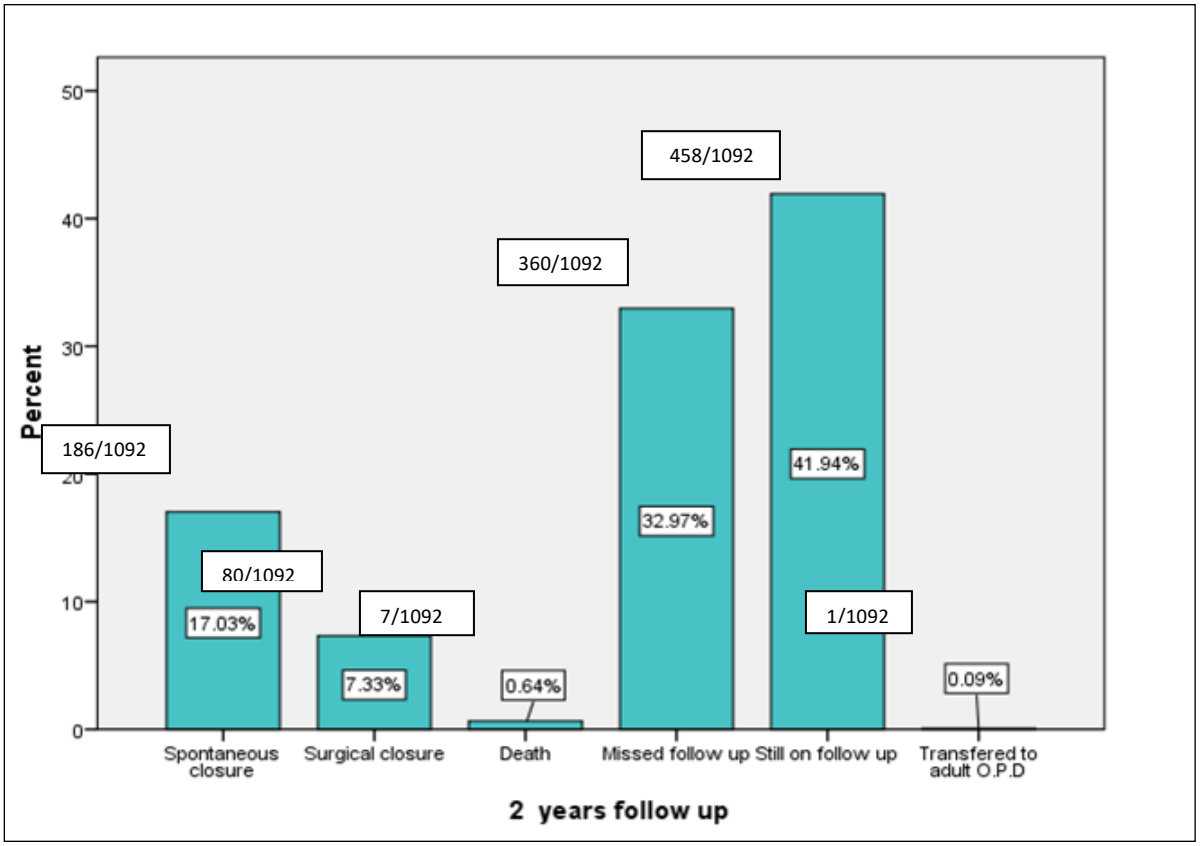

Fig (6): Show the Outcome of Patients with VSD after 2 Years Follow Up in Our Study.

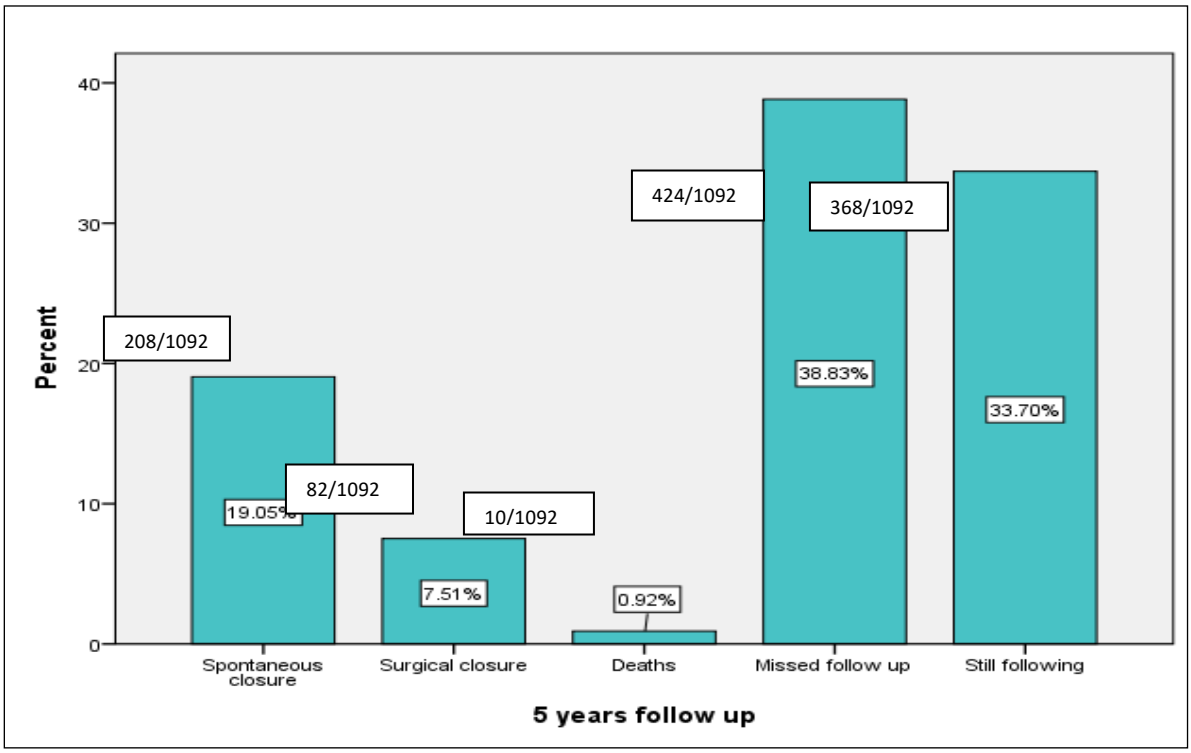

Fig (7): Show the Outcome of Patients with VSD After 5 Years Follow Up.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY981

TABLES

Table (1): Sex Distribution in Patients with Ventricular Septal Defect in Different Studies

Country	Male		Female		Total No of cases
	No	Percentage	No	Percentage	
Our study	**571**	**52%**	**521**	**48%**	**1092**
Turkey	**431**	**53.9%**	**368**	**46%**	**799**
Nigeria	**26**	**42.6%**	**35**	**57.3%**	**61**

Table (2): Shows the Place of Referral in Our Study.

			Frequency	Percent	
Place of refer	**Tripoli children hospital**	OPD	227	22.6 %	44.9%
		SCBU	93	8.5 %	
		Nursery	80	7.3 %	
		In patient	71	6.5 %	
	Other public hospital		268	24.5 %	
	Private clinic		218	20 %	
	Polyclinic		37	3.4 %	
	Indeterminate		78	7.1 %	
	Total		1092	100 %	

Table (3): Show the Relationship between Family History of CHD and Type of VSD.

			Family history of congenital heart disease			Total	P value
			Yes	No	In determinant		
VSD type	Peri-membranous	Count	108	447	0	555	0.001
		% within type	19.5%	80.5%	0.0%	100.0%	
	Mid-muscular	Count	0	205	0	205	
		% within type	0.0%	100.0%	0.0%	100.0%	
	Apical	Count	0	142	0	142	
		% within type	0.0%	100.0%	0.0%	100.0%	
	In determinant	Count	0	43	147	190	
		% within type	0.0%	22.6%	77.4%	100.0%	
Total		Count	108	837	147	1092	
		% within VSD	9.9%	76.6%	13.5%	100.0%	

Table (4): Shows the Relationship Between the Size of VSD and History of Hospital Admission.

Types of VSDs		History of hospital admission			Total	P Value
		Yes	No	indeterminate		
Small size	Count	255	442	34	731	0.001
	% within The Size	34.9%	60.5%	4.7%	100%	
Moderate size	Count	58	58	13	129	
	% within The Size	45%	45%	10.1%	100%	
Large size	Count	101	53	22	176	
	% within The Size	57.4%	30.1%	12.5%	100%	
indeterminate	Count	0	0	56	56	
	% within The Size	0.0%	0.0%	100%		
Total	Count	414	553	125	1092	
	% for history of admission	37.9%	50.6%	11.4%	100%	

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY981

Table (5): Show the Percentages of Ventricular Septal Defects Types in Different Studies.

Country	Peri-Membranous VSD	Muscular VSD
Our study	50.8 %	43.3%
Turkish study	76.4 %	21.4 %
Nigerian study	64 %	28 %
Saudi Arabia study	44 %	46.5 %

Table (6): Show the Relation Between the VSD Size and Mode of Treatment.

Mode of treatment		Size of VSD				Total	P value
		Small	Moderate	Big	Indeterminate		
No	Count	579	20	16	23	638	0.001
	%	90.8%	3.1%	2.5%	3.6%	100%	
Medical	Count	111	94	108	21	334	
	%	33.3%	28.1%	32.3%	6.3%	100%	
Surgical	Count	7	3	5	2	17	
	%	41.2%	17.6%	29.4%	11.8%	100%	
Medical & surgical	Count	5	8	45	6	64	
	%	7.8%	12.5%	70.3%	9.4%	100%	
Indeterminate	Count	29	4	2	4	39	
	%	74.4%	10.3%	5.1%	10.3%	100%	
Total	Count	731	129	176	56	1092	
	%	66.9%	11.8%	16.1%	5.1%	100%	