

Is Gender Matters in Paediatric Cardiac Surgery

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ABSTRACT:

Objective: To observe the potential effect of gender difference on the survival after pediatric cardiac surgery.

Materials and Methods: This retrospective cross sectional study was carried out in PCICU of Pediatric Cardiac surgery department at National institute of cardiovascular diseases Karachi, Pakistan from October 2013 till September 2015. Data was evaluated to find out the effect of gender on survival of patient during their post-cardiac surgery PCICU stay for structural heart defects.

Results: A total of 518 patients were operated for structural heart defects on pump and including glenn shunt and fonton procedure irrespective of use of pump. 68% of these were boys and 32% were girls. Unadjusted mortality was similar for both boys and girls (9% versus 8%, P=0.87). After adjustment of complex surgeries with Aristotle basic score > 8 like intervention for TGA, univentricular hearts and DVR, more prevalent in male population, the outcome was not significantly different with 5% v/s 4% for boys and girls respectively.

Conclusions: Patient's gender has a no significant effect on mortality after pediatric cardiac surgeries.

Keywords: Congenital heart surgeries (CHD), Aristotal score, Paediatric cardiac surgery, Gender, Mortality

INTRODUCTION:

Risk prediction of an intervention always have central role in decision making and counseling as well as quality assessment of care. In adult cardiac surgery different models of risk prediction are used for risk assessment. Literature provide considerable evidence that female gender carries a higher operative morbidity and mortality.^{1,2,3,4} Female gender is considered as an independent risk factor in various models like euroscore,⁵ parsonnet score⁶ and northern new England⁷ score. Various reasons were mentioned in literature for adverse outcome in female gender. However there is no consensus on fact behind these observations; some suggest it is inherent other suggest socioeconomic or cultural reason responsible for delayed referral. Nevertheless it is generally accepted that compared to male, female gender present with different risk profile when presented for cardiac surgery.^{8,9} Despite of same risk profile any

intervention to medically address the same condition may result in a very different result between the genders and a given postoperative complication have more adverse effect on women.¹⁰ Despite suggestion that female gender may be important risk factor for outcomes of cardiac operations, literature into gender-related influences on outcome of congenital heart disease (CHD) surgery or paediatric cardiac surgeries are sparse. Nevertheless when a review of literature was conducted for risk scoring system in paediatric cardiac surgery, we observed that scoring systems often lack complex integration of factors as in adult cardiac surgery risk scores. Scoring systems like RACHS¹¹ and the Aristotle score¹² used in paediatric cardiac surgery based on diagnosis and complexity of surgical procedure respectively. Thus predict more on the basis of diagnosis or intervention.

A recent report of risk-adjusted clinical data from the STS-CHSD data center failed to demonstrate effect of gender on the early postoperative mortality.¹³ While there are many reports showing; female gender was associated with as high as 50% higher odds of death.^{14,15,16} There may be an opposite trend than adults may be observed as it is well established fact that by nature normal female fetuses have a higher survival rate than male fetuses.¹⁷

In our study, we retrospectively analyzed data from the paediatric cardiac surgery department at NICVD to determine effect of gender on surgical outcome.

MATERIALS AND METHODS:

Post surgical admission record of PCICU of NICVD was reviewed. All the paediatric patients underwent open heart surgeries and Glenn and Total Cavopulmonary connections for univentricular physiology irrespective of the use of cardiopulmonary bypass pump and were included in the study. Patient under went off pump surgeries were excluded from study. Similarly patients requiring emergency intervention as well as with missing data regarding sex and age were excluded from study. Data was collected from October 2013 to September 2015.

Data was analyzed and presented with percentage for

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categorical data and numerical data with mean standard deviation. Two by two table was used to assess statistical significance of any association of unadjusted risk factor that is female gender with survival. After adjusting the risk factors like procedures with Aristotal score > 8 and double valve surgery, association of female gender with postoperative survival was also determined.

RESULTS:

After reviewing the record a total of 518 patients were included in this study. Their demographic data is shown in Table 1. 518 patients were operated in our department from October 2013 till September 2015. Patients shifted from PCICU to ward were 475 (91.6%) without shifting back to step up again. Among 518 patients total male patients were 350 (67.6%) compare to female patients 168 (32.4%). Incidence of unadjusted postoperative mortality was [30(8.5%) v/s 13(7.7%) p =.87] for males and females respectively. Though incidence of more complex procedures with Aristotal score >8 and double valve replacement were more prevalent in male population but it did not significantly influenced the outcome 12(5%) v/s 7(4%) for males and females respectively.

Table: 1
Demographic data

Variable	Numbers
Total	518
Male	350 (67.57%)
Female	168 (32.4%)
Age	
Neonates	11 (2.12%)
Children	507 (98%)

Table: 2
Diagnosis of patients or intervention where diagnosis is undefined and outcome of individual procedure is mentioned

Type of procedure	Numbers	Aristotal basic score	Mortality observed
TOF	276(52.5%)	8 (5 to 10%)	14(5.07%)
VSD	129 (25%)	6(1 to 5%)	6(4.6%)
ASD	58 (11%)	3(<1%)	1(1.7%)
TGA	22 (4.2%)		
TGA (ARTERIAL SWITH)	12	11(10 to 20%)	11(91%)
TGA (ATRIAL S WITCH)	10	11(10 to 20%)	6(75%)
MVR	4 (7%)	7.5(1 to 5%)	0
DVR	2		0
VSD + Aortic Regurgitation	1		0
TRICUSPID ATRESIA	17 (3%)		
TRICUSPID ATRESIA (GLENN)	11	7.5(1 to 5%)	2(18.2%)
TRICUSPID ATRESIA (TCPC)	6	9(5 to 10%)	2(33.3%)
TAPVR	2	9(5 to 10%)	1
PAPVR	5(.9%)	7 to 9(5 to 10%)	0
CAVCD	2	9(5 to 10%)	0
Total procedures	518		43(8.3%)

TOF (Tetralogy of Fallot) VSD (Ventricular Septal Dfect), ASD (Atrial Septal Defect), TGA (Transposition Of Great arteries), MVR (Mitral valve replacement), DVR (double valve replacement) PDA(Persistent Ductous Arteriousis), TCPC(total cavopulmonary connection),CAVSD(Complete Aterioventricular Canal Defect), TAPVR(Total Anamolus Pulmonary Venous Return), PAPVR(Partial Anamolus Pulmonary Venous Return)

DISCUSSION:

Gender is very important demographic variable mentioned in almost every study conducted on humans. Differences in outcomes for diseases and interventions between males and females are increasingly being observed . It is still undetermined whether gender affects outcome after pediatric cardiac surgery because before puberty, hormonal differences are less prominent. Nevertheless there is evidence that gender differences might play role in mortality and morbidity early in life. From fetal life to postnatal status there are many biological differences between both genders. Similarly it had been long known observation that male babies are more likely born preterm.¹⁸ Male children are more prone to deaths from respiratory¹⁹ and neurologic complications²⁰ than female children. Premature girls have higher serum level of catecholamines possibly responsible for their better survival.²¹ Effect of gender have been well observed for coronary artery disease , heart failure, valve disease, and pulmonary hypertension.^{22,23,24,25} Even females who survive myocardial infarction are more prone for re-infarction and higher mortality than males.²⁶ Gender related heart defect pattern difference is also common observation like more boys are presented with transposition of great vessels and left sided obstructive lesion than girls who present more with atrial septal defects and Ebstein’s anamoly.^{27,28} In children with congenital heart disease , little data exist on differences in operative / health outcomes between males and females. Evidence of gender related difference in surgical outcomes after pediatric heart surgery has been conflicting. Possibly results of different studies were confounded by the differential pattern and severity of CHD. Potential of selection biases and small sample sizes were major limitation of these studies. Chang and colleagues, reviewed large number of inpatient hospital records including almost all congenital heart surgeries with the aim to determine the effect of gender on outcome; females were found to have higher odds of death than males. Nevertheless it involved a single region while excluding low flow hospitals.²⁹ Same reports from California showed higher in hospital mortality rates for female children following cardiac surgery.³⁰ Harry has also reported increase association of adverse outcome with female gender with odds ratio 1.31.³¹ There are many reports suggestive of opposite trend in paediatric patients with adverse out come for male patients . New England Regional Infant Cardiac Registry presented with data showed that female infants had a 5% lower mortality.³² A cohort mortality study in patients observed higher death rates in males gender compared to females

with CHD . Pattern was persistent from 10 years of age and onward till adulthood.³³

Our study failed to demonstrate any difference in survival in either of gender. The predominance of males having CHD surgery compared to females was most significant finding of our study, 68% v/s 32% for males and females respectively. Though males had more severe CHD at birth, female sex failed to demonstrate a protective effect on surgical mortality. Limitations of our study are first it has retrospective study design. Secondly like analysis of any databases it is important to understand effect of documentation of record within the presented diagnostic and procedural report. Thirdly it must be paired with this consideration that is the potential presence of comorbidity profiles not related to surgical disease or intervention. Fourthly, this study does not directly examine the effect of payer status on risk-adjusted outcomes. Finally, inter institutional transfers cannot be tracked. Whereas the strengths of this study are, it is a single centre study and all patients were operated by two surgeons and got same level of care thus helping us in controlling many biases.

CONCLUSION:

Patient's gender has a no significant effect on mortality after pediatric cardiac surgeries. Although we have found that a higher proportion of males had high-risk procedures and underwent more CHD surgeries but we have observed no difference on the survival.

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