**Evaluation of the pediatric cardiac surgical international assisted campaign in Basra Governorate, Southern Iraq .**

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**Background**:

Congenital Heart disease is a structural or a functional defect in the heart and or

proximal blood vessels that are present at birth, The incidence is about 8 - 10 per 1000 live births across the globe (1). Geographically, populations may vary from country to country but the incidence has remained constant worldwide (2) . whoever it seems that the prevalence showed an increase in countries that shows high child birth ratios, Children born with CHD in developing countries do not have access to adequate care (2), (4).

Establishment of congenital heart surgery programs in developing countries is often impeded by competition among providers forscarce resources and opportunities (3). The common goal should be a universal reach of cardiac care with a concurrent decrease in mortality and morbidity from CHD. Presently there is a wide disparity in cardiac facilities. Over 70% of the facilities reach (4).

There is a significant, worldwide burden of CHD with estimates between 8 and 12 per 1000 live births. This estimate appears to be distributed evenly between countries while treatment options are not. Low- and middle-income countries tend to have higher fertility rates, which put a greater burden per wage earner in these countries (5).

### Local situation of CHD in Iraq had been discussed in several previous scattered series ,for example in Sulaymaniyah governorate The overall incidence of all types of congenital heart diseases was 1.7/1000, 1.6/1000 live births for the year 2015 and 2016 respectively(6).While in Baghdad from a total of ninety-six patients with congenital heart disease There were 48 patients had VSD (50%) and 18 patients were diagnosed as tetralogy Fallot (18.75%) and 14 patients showed to have patent duct arteriosus (14.58%), Nine patients were diagnosis as transposition of great arteries (9.37%) (7).A similar distribution in In Mosul where a prevalence of (6.1/1000 patients). Atrial septal defect (42. %), ventricular septal defect was detected (30%) and Patent ductus arteriosus (9.3%) are the most common CHD detected (8) . Whereas ,Basra series showed that from A total of 1414 echocardiography examinations were done over 24 months, five hundred seventy (40%) patients had CHD from which VSD was the most common CHD diagnosed by echocardiography and accounts for (43.3%) of the patients, followed by TOF 72(12.6%), ASD 68(11.9%), PDA 54(9.4%), AVSD 37(6.4%), PS 22(3.8%), complex heart defects (2.6%)(9) .

 By the time that it is so convinced fact that improved local capacity to repair CHD is important for improving the health of these children (4),(10)still pediatric cardiac surgery is considered as one of the rare specialties in Iraq according the ministry of higher education and scientific research which reflect the national great shortage in medical human resources of this specialty(11) .

A waiting list of local Purdon in Basra had reached to 221 patients till the end of August 2022 for which two relieving solutions had been adopted by the local government; Medical evacuation, medical recruitment.

In this study a comprehensive descriptive data will cover and compare the outcome of both approaches for which it is the 1st study on national level highlighting this issue

**Historical background**

Medical recruitment program in Basra had been established since 2005 in different specialty related axes ،pediatric cardiac surgery was one of its major domain ,since 2012 (International Children's Heart Foundation)team that emanate from the Dr Novich Alliance did start its effort on the level of Basra Governorate in 3 successive campaigns heled at December 2012,July 2013 ,and October 2013 to operate (15,20,16) case of pediatric CHD successively ,

A compulsory cessation that occurred after that for a period of 3 years resulted from the desire to move locally towards covering cardiac surgery cases for adult patients as a priority.to be resumed again on pediatric level in a single campaign held by the same team at 2016 to operate 14 case to got complete outage that continue for the next 4 years that had been attributed for a dire financial circumstances on the National level of the country that had accompanied ISIS invasion of parts of the country.

A minor reestablishment of the program at 2020 had been presented by the Indian recruitment team in cooperation with the Fortes’ hospital to operate only 12 cases to get interrupted also as The Corona crisis spread worldwide.

At 2022 as the new establishment of a novel governmental cardiac center, counselling with the local working team of the center had led to the comeback of the pioneer Novik alliance team to in 4 successive trips the led to cover more than 126 pediatric cardiac patient from the total of 225 waiting list cohort of Basra locality.

**Objectives:**

1. To highlights the demographic, medical related aspects of the campaign in a descriptive manner
2. To cover the overall outcome of the international campaign in an analytical way.
3. To highlight the pitfalls and advantages of the recruitment program in regarding the outcome of the cardiac surgery campaign.

**methodology & population**

**Methods**:

electronic database for a 143 patient that had been surgically treated by the cardiac governmental recruitment mission from a time extended from 20/01/2022 to 05/12/2022 had been created by the research team depending on real-time data entry plus refer to the records covering the following variables :patient's name ,birth date,gender,date of surgery weight,height,pre-op o2 saturation pre-operative hct,prematurity, chromosomal abnormality ,nutritional state ,final diagnosis, type of operation, bypass time cross clamp time, temperature ,duration of admission in ICU pacing, complication in ICU,ICU stay, being discharged/ dead, hospitalization period.

From this database analysis had been done to the data beside further categorization of complication profiles into 8 categories, outcome into 3 categories and RASCHS-1 classification (Risk Adjustment for Congenital Heart Surgery) had been applied to all of the procedures done, Using the RASCHS-1S-1 method, procedures were grouped into 6 risk categories, and institutions were ranked in order of increasing mortality rate, details of the score had applied according to the appendix (12), (13)

Analysis, tabulation, and related graphs plotting all had been accomplished through a multiple task labelled meeting of the research team.

**Population**:

patients of different ages, genders, diagnosis and procedures all had been enrolled in this analysis

**Statistics** both Microsoft 2020 office excel sheet and SPSS 26 had been formulated, processed to yield both a descriptive and comparative data tables,

 p value had been considered significant < 0.05 .

Data were analyzed using SPSS (Statistical Package for Social Sciences) statistical software, version 22 for Windows. Descriptive statistics were performed in relation to the distribution of variables and characteristics of the study population. Univariate analyzes were performed to assess the relationship between demographic and clinical variables and the outcome (mortality).

**Results**

Table (1) shows that the study patients' sexes were almost equal, their median age was 3.5 years, median BMI was 14.76kg/m2, median preoperative oxygen saturation was 95% (with a minimum of 35%), and median preoperative hematocrit level was 36.35%.

**Table (1): Basic characteristics of the study population**

|  |  |  |
| --- | --- | --- |
| **Variable**  | **Frequency** | **Percent** |
| **Sex:** | Male | 65 | 51.6 |
| Female | 61 | 48.4 |
|  | **Mean± SD** | **Median (Min.-Max.)** |
|  **Age at operation (yr)** | 4.95± 5.29 | 3.5 (0.25-29) |
| **BMI (kg/m2)** | 15.33±3.98 | 14.76 (2.88- 30.07) |
| **Preoperative O2 saturation (%)** | 88.28± 12.81 | 94 (35-99) |
| **Preoperative HCT (%)** | 38.99±8.71 | 36.35 (24-69) |
| **Total** | 126 | 100 |

In Table (2), it is clear that ventricular septal defect was the most frequent defect operated on (31.7%), followed by tetralogy of Fallot (28.6%).

**Table (2): Frequency of diagnoses among the study patients**

|  |  |  |
| --- | --- | --- |
| **Diagnosis** | **Frequency** | **Percent** |
| VSD | 40 | 31.7 |
| ToF | 36 | 28.6 |
| ASD | 16 | 12.7 |
| AVSD | 9 | 7.1 |
| DORV | 5 | 4.0 |
| RVOTO | 4 | 3.2 |
| TAPVR | 2 | 1.6 |
| SAR | 2 | 1.6 |
| COA | 2 | 1.6 |
| Single ventricle | 2 | 1.6 |
| Other  | 8 | 6.3 |
| **Total** | 126 | 100.0 |

The most frequent type of surgical procedures used to correct defects was the total defect repair (76.2%). Moreover, RASCHS-1S score 2 constituted in more than half of the cases (Table 3).

**Table (3): Type of the procedure followed to correct the pathology**

|  |  |  |
| --- | --- | --- |
| **Procedure** | **Frequency** | **Percent** |
| Total repair | 96 | 76.2 |
| BTS | 9 | 7.1 |
| PAB | 7 | 5.6 |
| Fontan procedure | 4 | 3.2 |
| RVOT resection | 3 | 2.4 |
| BDG | 2 | 1.6 |
| AVR | 1 | 0.8 |
| Sub-aortic ridge resection | 1 | 0.8 |
| KONO | 1 | 0.8 |
| ASO | 1 | 0.8 |
| MV repair | 1 | 0.8 |
| **RASCHS-1S score** |  |  |
| 1 | 16 | 12.7 |
| 2 | 68 | 54.0 |
| 3 | 40 | 31.7 |
| 4 | 2 | 1.6 |
| Total | 126 | 100.0 |

Those who needed to be paced in the ICU constituted 13.5%. the median time needed for bypass was 86min., median cross clamp time was 50min., the median lower temperature 34C, and median intubation period was 3.62hr (Table 4).

**Table (4): perioperative details**

|  |  |  |
| --- | --- | --- |
| **Variable** | **Frequency** | **Percent** |
| **Pacing in ICU** | 17 | 13.5 |
|  | **Number** | **Mean± SD** | **Median (Min.-Max.)** |
| **Bypass time** | 102 | 97.77±56.71 | 86 (24-451) |
| **Cross clamp time** | 97 | 59.45±31.98 | 50 (10-139) |
| **Lower temperature** | 101 | 33.86±0.78 | 34 (28-35) |
| **Intubation duration in ICU (hr)** | 126 | 8.94±21.47 | 3.62 (0-186) |

Table (5) clarify that the most frequent complication was respiratory infection and the percentage of complications was 15.9%. Moreover, mortality constituted about 4.8%. The median duration of stay in the ICU was 1 day, with a maximum of 13 days, and the median duration of stay in the hospital was 9 days, with a maximum of 40 days.

**Table (5): Outcome of the surgeries**

|  |  |  |
| --- | --- | --- |
| **Outcome** | **Frequency** | **Percent** |
| **Complication in ICU** | No | 106 | 84.1 |
| Respiratory infection | 6 | 4.8 |
| Arrhythmia | 4 | 3.2 |
| CVA | 2 | 1.6 |
| Diaphragmatic palsy | 2 | 1.6 |
| Sepsis | 2 | 1.6 |
| Convulsion | 1 | 0.8 |
| Mediastinitis | 1 | 0.8 |
| Pneumothorax | 1 | 0.8 |
| Bleeding | 1 | 0.8 |
| **Mortality** |  | 6 | 4.8 |
|  |  | **Mean± SD** | **Median (Min.-Max.)** |
| **ICU stay (Day)** | 123 | 2.47±2.28 | 1 (1-13) |
| **Hospital stay (Day)** | 126 | 10.35±5.33 | 9 (3-40) |

 **Discussion:**

 one hundred twenty-six patients had been enrolled in the analysis of this descriptive study representing the total harvest of the initial pediatric cardiac surgery recruitment campaign .

sex distribution of the cases was almost equal, their median age was 3.5 years, median BMI was 14.76kg/m2, median preoperative oxygen saturation was 95% (with a minimum of 35%), and median preoperative hematocrit level was 36.35%., similar sex distribution seen in other series in Peshawar (13)

ventricular septal defect was the most frequent defect operated on (31.7%), followed by tetralogy of Fallot (28.6%). A similar trend was also seen in Asian countries like Pakistan (14) .

The most frequent type of surgical procedures used to correct defects was the total defect repair (76.2%). Moreover, RASCHS-1S score 2 constituted in more than half of the cases, a corresponding series in middle east region did showed a similar distribution like that in Jeddah, Norwood procedure (31.5%), aortic coarctation repair (13.8%), arterial switch operation (13%), and Blalock-Taussig and central shunts (10%) (15), and in Abu Dhabi where Single-stage primary complete repair has become the central philosophy since the

1980s. In about thirty percent, physiologic and anatomical reasons do not permit repair by a single operation. (16)

 RASCHS-1S score of this studied patients was almost of score 2 and 3 (54.0%,31.7%) respectively with a minority of the score 4 (1.6%) such categorization was incident due to the recommendation by the health authority and the treating team and the campaign authorship to make this initial campaign designated to include lower risk cases ,an exceptional of enrollment of two cases with score 4 enrolled This happened due to the fact that the cases were critical and could not be referred to a treatment program outside the country.

A similar strategy and RASCHS-1S-1 figure was in the largest national Lebanese cohort (RASCHS-1S-1–3(38.6%), Categories 4 (10.9%)) respectively (18)

A higher initial RASCHS-1S score did exist in this study in comparison to a German study in which RASCHS-1S score was around 1 for the total 598 patient enrolled (19)

Bypass time mean for the whole 102 patient was 97.77±56.71 hour which is lower than many series like in Italy in which it was 128.8 ± 89.2 hour for the total of 264 patient enrolled (20) and in 271 other study in Vanderbilt University Medical Center pediatric cardiac surgery patients were studied with mean CPB and cross clamp times of 107 ± 70. (21)

Intubation duration in ICU (hr) was 8.94±21.47 as a mean for the cohort which seem to be corresponding to other studies like a study in Rajaie Cardiovascular Medical and Research Center, Iran University of Medical Sciences, Tehran, IR Iran The duration of mechanical ventilation (MV) is one of the most important clinical factors which predict outcomes in pediatric cardiac surgery. The PMV was defined as mechanical ventilation duration more than 72 hours as medium PMV and more than seven days as extended PMV (22)

 16% of enrolled patients did show at least one early complication (initial 30 postoperative complications) in form of respiratory infection 4.8%, arrhythmia 3.2 % as a major category with lesser frequency of others, a figure that is greatly differs from almost all other corresponding series like Indonesia at which (84.1%) had complications, including low cardiac output syndrome (19.8%), arrhythmia (18.6%), sepsis (17.4%) (23)

Infectious complications after cardiac surgery still also a common issue. In high-income countries, the prevalence of bacteremia varied from 1.5% to 10.2%(24) and in Jeddah, Saudi Arabia, at which overall postprocedural complications were reported in 96 (73.8%) of the procedures. The most frequent complications were prolonged postoperative mechanical ventilation (27%), pleural effusion (21%), excessive bleeding (19%), cardiac arrest (18%), and systemic infections (18%)(14) a single center statistics in Nashville, USA did showed that (43%) had ≥1 complication , (25%) developed cardiac and 120 (37%) developed extracardiac complications (25) while in Iranian study (29.2%) of the enrolled patients were showed complications(26)

 Six patients died (4.8%) in this study a figure which is to be corresponding or less than that in the Studies published in other developing countries to estimate mortality had found China (5.5%)(27)Iran (12.4%)(26) India (7.9%)(28) and Guatemala (10.7%)(29)

Such a low mortality in this cohort of patient could be explained by several factors like the lower RASCHS-1S score of the enrolled patients (1.4% of score 4), lesser percentage of the cyanotic congenital heart diseases enrolled and the shorter time of aortic cross-clamp time when it is compared to these corresponding series like in Iran and Indonesia

(70.2 ± 36.6),(CPB, OR: 4.4, 95% CI: 1.5–13.4) respectively(23),(26) .beside that the current literature that suggest that prolonged CPB is associated with a much higher incidence of adverse outcomes(20.),(30)

This lower figure of postoperative complications could be attributed to the lower RASCHS-1S score of this cohort as higher RASCHS-1S levels were associated with a greater number of extracardiac complications (31).

**Conclusions:**

1. Initial 30 -days complications and disease related mortality of the studied patients were satisfactory and of lower bordun of incidence than comparable cohorts.
2. Lower mortality ratio was greatly explained by the sample characteristics and the evidence based known predictors of mortality like RASCHS-1S-1 score ,lower cyanotic disease frequency and the shorter time of aortic cross-clamp time.

**Limitations:**

1. The study design was of a descriptive category
2. Lake of the correlational analysis in regards to the morbidity and mortality

**Recommendations:**

1. Augmentation of the recruitment local governmental cardiac surgery program to enroll more patients of the same risk categories.
2. Encouragement of the medical training with the utilization of similar campaigns
3. Conduction more analytical elaborations for the data in regarding the procedure related morbidity and mortality.
4. Conduction a correlational future study to highlights the local figure in regarding to the risk factors of mortality and complications.

**Conflict of interest**

All authors declare no conflict of interest and no personal circumstances that may be inappropriately influencing the representation or interpretation of research results.

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