FULL LENGTH ARTICLE

Outcome of low body weight (<2.2 kg) infants undergoing cardiac surgery

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Introduction: **Infants with low body weight (LBW) following cardiac surgery are a major challenge for the post cardiac surgery care unit. It has been observed that post surgery outcome for LBW infants is worse compared to the outcome of normal body weight infants. A study was conducted to compare post operative course and outcome of infants with body weight of 2.2 kg or less against infants with normal body weight who underwent similar cardiac surgeries.**

Methods: **A retrospective review was performed for all infants below 2.2 kg who underwent cardiac operations at King Abdulaziz Cardiac Center from January 2001 to October 2011. Cases with LBW (Group A) were compared with matching group (Group B) of normal body weight infants who had similar cardiac surgeries and matching surgical risk category. The demographic, ICU parameters, complications, and short-term outcome of both groups were analyzed.**

Results: **Two groups were formed, with 37 patients in Group A, and 39 patients in Group B. Except for weight (2.13 ± 0.08 kg in Group A vs 3.17 ± 0.2 kg in Group B), there was no statistical difference in demographic data between both groups. Cardiac procedures included coarctation repair, arterial switch, ventricular septal defect (VSD) repair, tetralogy of Fallot repair, systemic to pulmonary shunt and Norwood procedures. Patients in Group A had statistically significant difference from Group B in terms of bypass time ($p = 0.01$), duration of inotropes ($p = 0.01$), duration of mechanical ventilation ($p = 0.004$), number of re-intubations ($p = 0.015$), PCICU length of stay ($p = 0.007$), and hospital mortality: 13.5% in Group A vs 0% in Group B (p value 0.02).**

Conclusion: **Patients with LBW (<2.2 kg) underwent cardiac surgery with overall satisfactory results, but with increased risk of ICU morbidity and mortality.**

Keywords: Post operative, Pediatric, Cardiac surgery, Low body weight

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Introduction

Evidence indicates that infants with congenital heart disease (CHD) are more prone to low body weight (LBW). LBW in CHD infants is caused by various contributing factors such as low birth weight, severe malnutrition due to state of cardiac failure, and poor nutritional status due to repeated infections requiring cardiac surgery. Incidences of low birth weight were reported to be approximately 8–23% of live born infants with congenital heart disease, and these incidences also varied with specific congenital heart defects [1–3]. LBW infants with CHD are usually critically ill, may have other organ dysfunctions, and may need early cardiac surgical interventions. Patients, however, may require emergency surgery that cannot be delayed without significant risk to their life. Several single institutional studies have been carried out in the last 25 years, reporting significant morbidity and mortality in LBW infants who underwent cardiac surgery [4–7]. The challenge remains to balance the risk of performing early cardiac surgery on LBW patients, or to delay for weight gain. In the past, concerns over increased mortality and morbidity in low birth weight infants have led some centers to delay surgical intervention until somatic growth reaches a specific weight [13]. But recent studies report that delaying surgery for somatic growth may deprive babies from urgently needed surgery with consequent increases in morbidity and mortality [12,13]. The rate of somatic growth in children with infants hearts is slow, and is often an unachievable mission.

Over the last two decades there have been significant improvements in the outcomes following neonatal cardiac surgery in general, and in LBW babies in particular. However, LBW infants continue to be an independent risk factor for adverse outcomes following corrective or palliative neonatal heart surgery. Recently, there have been encouraging studies suggesting that complex cardiac surgery can be performed in low weight infants who might otherwise not survive without surgery.

List of abbreviations

LBW	low body weight
Kg	Kilograms
RACHS-1	Risk Adjustment in Cardiac Surgery
ICU	Intensive care unit
ASO	Arterial Switch operation
IAA	Interrupted Aortic Arch
VSD	Ventricular septal defect
AVSD	Atrio ventricular septal defect
Kg	Kilogram
CM	Centimeter
LOHS	Length of hospital stay
Hrs	Hours
Min	Minutes
n	Number
TOF	Tetrology of fallot
PA	Pulmonary Atresia
MBTS	Modified blalock taussing shunt
PA Band	Pulmonary artery band
COA	Coarctation of Aorta
PCICU	Pediatric cardiac ICU
ECMO	Extra Corporeal Membrane Oxygenator
RSV	Respiratory syncytial virus

Low body weight in cardiac surgery is deemed as 2.5 kg or below [4,5,8], though it can be 2.0 kg and below [10,18].

This study was conducted to observe the effect low body weight has on the post operative course and outcome of infants undergoing cardiac surgery. We selected 2.2 kg to be the cutoff point for low body weight, as the majority of previous studies had a mean weight of 2.5 kg among their study subjects.

Material and methods

We conducted a retrospective study of all infants weighing less than 2.2 kg undergoing cardiac surgery operations for congenital heart disease at King Abdulaziz Cardiac Center between January 2001 and October 2011. Infants who underwent ligation of patent ducts arteriosus as their primary surgical procedure were excluded. Our database center and chart review were used to collect demographic data, anatomic diagnosis, associated preoperative risk factors, Risk Adjustment for Congenital Heart Surgery 1 (RACHS-1) score

Table 1. Summary of demographics in both groups (kg: kilograms, n: number).

Variable	Group A $n = 37$ low weight group	Group B $n = 39$ control group	P value
Average age (days)	24.3 ± 15.4	35.8 ± 40.9	0.112
Average weight (kg)	2.1 ± 0.08	3.2 ± 0.1	0.0001
Gender (males/females)	22/15	23/16	
RACHS-1(1-3)	32	36	0.2
RACHS-1(4-6)	5	3	0.2