

# EFFECT OF CARDIOPULMONARY BYPASS ON POSTOPERATIVE NUTRITION OF CARDIAC SURGERY PATIENTS

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## Abstract

**Introduction:** Nutrition is an important factor for recovery following cardiac surgery. Most patients lose appetite and have reduced nutrition following cardiac surgery. Several factors including pain, anxiety, medications, whole body inflammatory response, Cardiopulmonary bypass (CPB) have role in postoperative anorexia and reduced nutrition.

**Objective:** Objective of this study is to find out the role of CPB in postoperative anorexia and nutrition.

**Methodology:** This prospective study was conducted at NICVD. 30 randomly selected adult patients who had undergone open heart surgical procedures were compared to same number of closed heart surgery patients. The daily food intake was calculated from the ICU data-sheets and calorie value obtained. The values were compared between the open and closed heart surgery patients.

**Results:** It was noted that the open heart surgery patients took significantly less amount of food and calorie compared to the closed heart surgery patients.

**Conclusion:** Open heart surgery is a situation where post operative nutrition plays a very significant role in patient's recovery. But unfortunately there is a tendency of the patient's taking low calorie intake for various reasons. This may have a critical role postoperatively. So adequate measures should be adopted to ensure proper postoperative nutrition following open heart surgery.

## Introduction

Cardiac surgery itself is a major trauma for all patients. A number of different factors influence recovery following surgery. Among these, nutrition plays an important part in deciding recovery. On the other hand, a number of other different factors affect the food intake, and there by nutrition as well, following open heart surgery. Objective of this study was to observe the effect of Open heart surgery on the postoperative calorie intake of cardiac surgery patients. This will help the surgeons in better planning of the postoperative nutrition care of the patients.

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Cardiopulmonary bypass (CPB) initiates a whole body inflammatory response that affects body physiology. CPB is associated with bleeding and thrombotic complications, massive fluid shifts, along with cellular and hormonal defense reactions that are collectively termed "the whole body inflammatory response". A host of vasoactive substances are produced, released or altered during cardiopulmonary bypass. These hormones, autacoids, and cytokines react with specific receptor proteins distributed throughout the body, and mediate the vascular smooth muscle and endothelial cell contractions that are responsible for much of the morbidity associated with open heart operations<sup>1</sup>. Important alterations in sympathetic nervous system (SNS) activity and thyroid hormone homeostasis occur in humans during cardiac surgery and hypothermia, and that changes in core temperature may contribute to these findings. These hormonal changes may influence the response to adrenergic receptor therapy in hypothermic patients and may contribute to arrhythmias during rewarming and the immediate postoperative period<sup>2</sup>. Marked alterations in levels of circulating thyroid hormone were found in patients undergoing cardiopulmonary bypass with a rise in the free thyroxine and a fall in the free triiodothyronine levels. Studies using thyrotropin-releasing hormone during bypass demonstrated a blunted response to this stimulus. This reduced response is related to changes in thyroid hormone levels and it is suggested that bypass surgery may have a direct inhibitory action on thyroid-stimulating hormone release at the hypothalamo-pituitary level<sup>3</sup>. Endotoxin, when released into the systemic circulation during cardiopulmonary bypass (CPB), might induce activation of plasmatic systems and blood cells during CPB, in addition to material-dependent blood activation during CPB. A release of endotoxin into the systemic circulation associated with tumor necrosis factor formation, which contributes to the whole-body inflammatory reaction associated with CPB<sup>4</sup>. Cardiopulmonary bypass, even with state-of-the-art equipment, undoubtedly causes sub-clinical organ damage, which has been demonstrated for the lungs, kidneys, nervous system, coagulation cascades, inflammatory pathways, gastrointestinal tract<sup>5</sup>, and the heart itself. Postoperative food intake is frequently complicated by delayed gastric emptying<sup>6</sup>. All these things together results in reduced food intake, there by reduced nutrition of the open heart surgery patients.

## Materials and Methods

This prospective study was conducted at the Dept. of Cardiac Surgery, National Institute of Cardiovascular Diseases, Dhaka between January and July 2006. The study population

**Table-I:** Sample daily diet after Open heart surgery 2<sup>nd</sup> POD / DVR / 48 kg / 1551 Kcal

Time	Item	Calorie
8 AM	Bread 2 loaves	85
	Egg 1 piece	50
10 AM	Banana 1 piece	85
	Orange 1 piece	60
12 Noon	Rice 325 gm	379
	Chicken 60 gm	100
4 PM	Ensure 100 ml	100
	Banana 1	85
	Orange 1	60
8 PM	Rice 300 gm	350
	Chicken 70 gm	123
6 AM	Biscuits 4 pieces	160
	Ensure 200 ml	200

consisted of 30 randomly selected adult patients who had undergone open heart surgical procedures July 2000 and January 2001. A randomly selected control group comprising of the same number of patients who had undergone closed heart surgical procedures was also studied. The amount of calorie intake was calculated from the amount of food consumed using a nutrition value chart. The ICU data-sheets were the source of information regarding the food intake. The daily total calorie intake was measured for the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> post-operative day. Energy consumption for each food items was calculated separately and added together to obtain the daily energy intake. The values were compared between the open and closed heart surgery patients.

**Table-II:** Sample daily diet after Closed heart surgery 1<sup>st</sup> POD / CMC / 45 kg / 1965 Kcal

Time	Item	Calorie
8 AM	Biscuits 4 pieces	160
	Egg 1 piece	50
10 AM	Paratha 2 pieces	200
	Egg 1 piece	50
2 PM	Rice 210 gm	245
	Meat 60 gm	100
5 PM	Revit-R 250 ml	250
	Biscuits 4 pieces	160
8 PM	Rice 240 gm	270
	Fish 100 gm	100
6 AM	Biscuits 2 pieces	80
	Revit-R 200 ml	200
	Fruits	50

## Results

It is observed that the caloric intake of the open heart surgery patients is less than that of the closed heart surgery in general. The average caloric intake for the open heart surgery patients on the 1<sup>st</sup> and 2<sup>nd</sup> post operative days were 1014.14 and 1435.6 respectively. On the other hand, average caloric intake for the closed heart surgery patients on the 1<sup>st</sup> and 2<sup>nd</sup> post operative days were 1556.65 and 1886.3 respectively. When body weight of the patients is taken into consideration, the difference becomes also evident. Open heart surgery patients consumed 21.36 and 30.34 K Cal per Kg of body weight on the 1<sup>st</sup> and 2<sup>nd</sup> postoperative day where as their closed heart counterparts consumed 37.02 and 45.35 K Cal per Kg respectively.

**Table-III:** Food value per ounce (30gm)

Item	Energy
Cooked Rice	35 Kcal
Chapati	75 Kcal
Bread	78 Kcal
Pulses	100 Kcal
Cheese	104 Kcal
Sugar	118 Kcal
Biscuit	120 Kcal
Butter	225 Kcal
Veg.(leafy)	6 Kcal
Veg (others)	15 Kcal
Milk	20 Kcal
Banana	26 Kcal
Fish	30 Kcal
Chicken	40 Kcal
Meat	50 Kcal
Egg (one)	50 Kcal

postoperative day. The difference was less on the 2<sup>nd</sup> day, but still remarkably high at around 451 K Cal. The difference gradually came less and reached insignificant level towards the end of the week. When the body weights of the patients are taken into consideration, the difference is also evident. So the open heart surgery patients are likely to suffer from the adverse effects of inadequate caloric intake following surgery. This may affect the recovery of the patients. There should be measures to encourage open heart surgery patients. These include taking adequate amount of food with high nutritious

value, add appetizers like lemon, pickle etc. Early postoperative administration of nutrients after surgery stimulates gastric emptying<sup>6</sup>. Table shows a list of suggested measures for reducing the adverse effect of open heart surgery on appetite and also for encouraging increased caloric intake following surgery.

**Table IV:** Comparison Between Total Calorie Intake Of Open & Closed Heart Surgery Patients

Type	1 <sup>st</sup> POD	2 <sup>nd</sup> POD
Open	1014.14	1435.6
Closed	1556.65	1886.3

**Table-V:** Comparison of calorie intake per kg of body weight of open & closed heart surgery patients

Type	1 <sup>st</sup> POD	2 <sup>nd</sup> POD
Open	21.26	30.34
Closed	37.02	45.35

**Table-VI:** measures to improve intake by open heart surgery patients

# Pre-operative Counseling
# Minimizing operation time
# Proper Perfusion technique
# Early mobilization
# High calorie diet
# Addition of appetizers to diet like lemon, pickles etc.
# Early release from ICU & Hospital

## Conclusion

Open heart surgery is a situation where post operative nutrition plays a very significant role in patient's recovery. But unfortunately there is a tendency of the patient's taking low calorie intake for various reasons. This may have a critical role postoperatively. So adequate measures should be adopted to ensure proper postoperative nutrition following open heart surgery.

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