# Factors Affecting Post Open-Heart Surgery Outcomes for Hospitalized patients

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## Abstract

**Background:** Open heart surgery plays an important role in the management of cardiovascular diseases. A number of preoperative predictive factors for complicated Intensive Care Unit (ICU) stay were identified. Postoperative outcomes are dependent on the type of these predictive factors. **Aim:** study aims to assess factors affecting post open-heart surgery outcomes for hospitalized patients. **Research question:** What are the factors affecting post open-heart surgery outcomes for hospitalized patients?**. Study design:** descriptive explanatory research design was selected to fulfill the aim of the study. **Setting:** Post Cardiothoracic ICU at Cardiothoracic and Vascular Surgery Hospital, Ain Shams University. **Subjects:** 120 patients who undergone open heart surgery (CABG / Valve Replacement). **Data collection tools:** 1) Patients' assessment questionnaire including: demographic characteristics of patients and medical history data 2) open heart surgery assessment questionnaire, 3) European system for cardiac operative risk evaluation (EURO score II), 4) Patient's self-care knowledge assessment questionnaire, 5) Patient's self-care practice observational checklist. **Result:** The results of this study revealed that mean age of the studied patients was above fifty and slightly less than three quarters of them were males, less than three quarters were overweight, most of them had hypertension and diabetes mellitus, three quarters of the studied patients were at low risk of death according to EURO Score II, and the majority of them had satisfactory level of self-care practices and knowledge. **Conclusion:** The current study concluded that preoperative vital signs and use of preoperative and intraoperative use of cardiac inotroptic drugs in addition to postoperative delay of regaining consciousness and postoperative ICU stay; were the most significant factors affecting outcomes. **Recommendation:** Educational program and instructions to follow after the surgery is needed to improve the outcomes.

**Keywords:** Factors, Patient's Outcomes, Open heart surgery**.**

## Introduction

Open-heart surgery plays an important role in the management of wide range of cardiovascular diseases (CVD) and encompasses the care of a patient with greater acuity and complexity. Cardiac surgery, including coronary artery bypass grafting (CABG) and heart valve surgery represent the most common classes of surgical procedure performed globally***(Abdallah, 2012).***

Measuring outcomes of the open heart surgery might be done through indicators like length of hospital stay and duration of mechanical ventilation. Traditional outcomes measures include successful operation, incidence of serious complications like stroke, myocardial infarction or bleeding and death ***(Myles & Devereaux, 2010).***

Several studies have been done to determine the risk factors influencing the patients' outcomes after cardiac surgeries. Numerous factors and wide range of patients' conditions make the interpretation of each factor's effect difficult. Meanwhile, any of these factors can affect other factors and strengthen or weaken their effect. ***(Capdevill, Lee & Taylor, 2011).***

**Significance of the study:**

Identification of factors affecting post open-heart surgery outcomes for hospitalized patients can be utilized by the health team members in the future plan of care for such group of patients and will improve proper post-operative patient's self-care after cardiac surgeries that can reduce readmission rate to the ICU that may be associated with higher costs and may be correlated with increased mortality.

**Aim of the Study:**

This study aims to assess factors affecting post open-heart surgery outcomes for hospitalized patients through:

1.Assessing patients' bio - demographic and specific comorbidity data.

2.Identifying factors that may affect open-heart surgery outcomes for hospitalized patients.

3.Assessing patients' knowledge and practices regarding self-care post open-heart surgery.

The aims of this study have been achieved through answering the following question:

- What are the factors affecting post open-heart surgery outcomes for hospitalized patients?

**Subjects and Methods**

**Technical Design:**

The technical design for this study includes research design, research setting, subjects for the study and tools for data collection.

**Research Design:**

A descriptive explanatory research design was selected to fulfill the aim of the study and answer the research question.

**Research Setting:**

The study was conducted at Post Cardiothoracic surgery ICU at Cardiothoracic and Vascular Surgery Hospital affiliated to Ain Shams University Hospitals.

**Subjects:**

A convenient sample included 120 patients in post open-heart surgery from the previously mentioned setting. The sample size represents about 50% of admitted cases of patients underwent open-heart surgery during the year 2016 (220 patients) through EPI info program.

**Tools for data collection:**

Data were collected using the following tools:

**I: Patients' assessment questionnaire:**

It was designed by the researcher in Arabic language after reviewing the recent and related literatures to assess patients' demographic and medical history data. It consists of two parts:

- **Part one:** It includes demographic data of th studied patients including Age, gender, level of education and residence.
- **Part two:** It includes medical history about the studied patient including Type of surgery, body mass index, present medical history and past medical history.
- **Part three:** It includes post open-heart surgery outcomes including discharged on time, prolonged hospitalization and death.

**Scoring system:**

The response for each item in the questionnaire was either "Yes" or "No ". The answer "Yes" was scored "One" and the answer "No" was scored "Zero". The frequency and percentage for each item in the demographic and medical data was calculated.

**II: Open-heart surgery assessment questionnaire:**

This questionnaire was developed by the researcher after reviewing the recent related literatures to assess the preoperative, intraoperative and postoperative factors affecting the patients' outcomes post open heart surgery during hospitalization. It involves three parts:

**Pre-operative assessment part:**

It covers pre-operative patient's assessment such as pre-operative vital signs, pre-operative laboratory findings, use of inotropic drug treatment and use of assistive cardiac devices such as pacemaker or intra-aortic balloon

**Intra-operative assessment part:**

It covers the intra-operative data assessment such as time consumed during the operation and unexpected intra-operative events such as cardiac arrest, use of cardiac inotropic drugs, use of cardiac assistive devices, excessive bleeding and arrhythmias.

**Post-operative assessment part:**

It covers post-operative data assessment such as post-operative vital signs, time of regaining consciousness, post-operative ICU stay, hours of mechanical ventilation, time of chest tube removal, Use of cardiac assistive devices and post-operative complications (cardiac arrest, excessive bleeding, acute renal failure, surgical site infection, infection (Urinary Tract Infection 'UTI' - Ventilator Associated Pneumonia 'VAP'), delay of cardiac inotropic drugs discontinuation, re-intubation \ ventilation and arrhythmias).

**Scoring system:**

The response for each item in the questionnaire was either "Yes" or "No". Regarding the vital signs and laboratory investigations, they were considered normal when the results fall into their normal range. The answer "Yes" was scored "One" and the answer "No" was scored "Zero". The frequency and percentage for each item in the open-heart assessment questionnaire was calculated.

**III: European system for cardiac operative risk evaluation (EURO score II):**

This tool is adopted from the European Association for Cardiothoracic Surgery (2011) for assessment the factors affecting post open-heart surgery outcomes.

**Scoring system:**

The response for every item in the questionnaire was either "Yes" or "No ".The scoring of this tool was categorized as follow:

**0 - ≤2:** Low risk for post-operative death

**>2 - <5:** Moderate risk for post-operative death

**>5:** High risk for post-operative death**)**

**IV: Patient's self-care knowledge assessment questionnaire:**

This questionnaire was developed by the researcher in Arabic language based on reviewing the recent related recent literature to assess patients' knowledge about self-care after open-heart surgery. It involves 32 statements regarding nutrition (6 items), drugs (6 items), daily living activates (8 items), wound care (7 items) and warning signs (5 items).

**Scoring system:**

Every correct answer was given "One" score and the incorrect answer was given "Zero" score. The total score for the subtotal items and the total questionnaire were summed up then categorized into satisfactory if score≥ 75 % and unsatisfactory if score < 75%.

**V: Patient's self-care practice observational checklist:**

This checklist was developed by the researcher based on reviewing the recent related literature to assess patients' self-care practices regarding deep breathing exercises (6 steps), cough exercises (6 steps), spirometer exercises (10 steps), shoulder exercises ("4 steps"), trunk exercises ("13 steps") and arm exercises ( "14 steps").

**Scoring system:**

Every step that was done was given "One" score and the step that wasn't done was given "Zero" score. The total score for the subtotal items and the total checklist were summed up then categorized into satisfactory if score ≥ 75 % and unsatisfactory if score < 75.

**Operational design:**

The operational design of this study includes preparatory phase, tools validity and reliability, pilot study, ethical consideration and field work.

**Preparatory phase:**

It includes reviewing the past and current, local and international related literature and theoretical knowledge of various aspects of the study using books, articles, internet, periodicals and magazines to develop the tools for data collection.

**Validity and Reliability:**

The developed tools were tested and evaluated for their face and content validity. Face and content validity are tested via five experts in the medical surgical departments Faculty of Nursing Ain Shams University.

The experts' elicited responses regarding either by "agree", "disagree" or "Disagree with modification".

The developed tools were modified according to experts' opinions. These modifications were in the form of omission or addition of some questions or rephrasing of some statements.

**Reliability:**

Alpha Chronbach Test was used to measure the internal consistency of the five tools used in the current study as follow: 1st tool: Patient assessment questionnaire is (0.822), 2nd tool: open heart surgery assessment questionnaire is (0.871), 3rd tool: Europian system for cardiac operative risk evaluation (EURO score II) is (0.862) [International Reliability Score], 4th tool: patient's self-care knowledge assessment questionnaire is (0.919) and 5th tool: patient's self-care practices observational checklist is (0.898).

**Pilot study:**

The pilot study was conducted on 12 patients (10% of total sample) during hospitalization at Post Cardiothoracic surgery ICU, to ensure the clarity of the study questions, applicability of the study and the time needed to fill in the questionnaires. A few modifications were done after pilot study and those patients who were included in the pilot study were excluded from the actual study sample.

**Ethical consideration:**

The study subjects were assured that all the gathered data will be used for the research purpose only. They were informed about the purpose and the expected outcomes from the study. They were assured that, the study is harmless and their participation is voluntary and they have the rights to withdraw from the study at any time and without giving any reasons. They assured also that confidentiality was guaranteed.

**Field work:**

- The actual field work and the process of data collection has consumed six months; started from the beginning of April 2018 till the end of September 2018.

- The data were collected at morning and afternoon shifts.

- The researcher interviewed the patients who agreed to participate in the study individually. The researcher explained the aim and objectives of the study to every patient and the family member who accompany him / her.

- The study tools were filled by the researcher and all the tools were filled in within 30 to 40 minutes for every patient. The relatives of the patients were sometimes answering about some questions.

- Tool I "Patients' assessment questionnaire" and tool IV "Patient's self-care knowledge assessment questionnaire" were filled after interviewing every patient and his / her relatives. In addition, tool II "Open-heart surgery assessment questionnaire" and tool III "European system for cardiac operative risk evaluation (EURO score II)" were filled using the patient medical record. Finally, tool V "Patient's self-care practice observational checklist" was filled during observation of the patients during the first few days after the operation.

**Administrative design:**

An official letter was issued from the Faculty of Nursing, Ain Shams University to the Manager of Cardiothoracic and Vascular Surgery Hospital to attain his permission to conduct the study. An informed and oral consent was obtained from every participant who agreed to participate in the study.

**Statistical design:**

The collected data were coded, entered into and analyzed using the statistical package for social sciences, version 20.0. Quantitative data were expressed as mean and standard deviation (SD). Qualitative data were expressed as frequency and percentage. Chi-square ($x^2$) test of significance was used in order to compare proportions between two qualitative parameters. The confidence interval was set at 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as follow:

- P-value >0.05 was considered nonsignificant.
- P-value <0.05 was considered significant.
- P-value <0.001 was considered as highly significant.

## Results

**Table(1):** Regarding patients' demographic data, this table shows that, 40 % of patients under study were between the age group 50 to less than 60 years, 73.3 % of the studied patients were males, 59.2 % of them got university level of education, and 60 % lived in urban areas.

**Table (2):** As regards the studied patients' medical history, this table shows that, 70 % of them were over-weight, while none of them was underweight. As regards present medical history, 85 % of the studied patients had HTN, 83.3 % of them had DM. the same table also reveals that only 1.7 % of the studied patients were re-operated within 1 month from the previous surgery.

Additionally, as regards past medical history, 65 % of the studied patients were smokers and 20 % of them had history of arrhythmias. Also, the table revealed that, 95.8 % of the studied patients were receiving anticoagulants drugs.

**Figure (1):** Regarding post-operative outcomes for the studied patients, this figure shows that 79.2 % of them have been discharged on time, 12.5 % were hospitalized for a long time (more than 10 days) while 8.3 % of them died.

**Figure (2):** As regards total open-heart surgery risk evaluation for the studied patients using EURO score II, figure 2 shows that 75 % of them were at low risk for death, 10 % were at moderate risk for death, while 15 % of them were at high risk for death.

**Figure (3):** Regarding total satisfactory level of knowledge and self-care practices post open-heart surgery among the studied patients this figure shows that, 96.7 % of them had satisfactory level of self-care practices while, 93.3 % of them had satisfactory level of knowledge.

**Table (3)**: This table reveals that there are statistically significant relations between post-operative outcomes and the use of cardiac assistive devices pre-operatively at P value = 0.004. Moreover, there are highly statistically significant relations between the studied patients' post-operative outcomes and their pre-operative vital signs and use of inotropic drugs. Also, there is no significant relation between the

studied patients' post-operative outcomes and their pre-operative laboratory investigations, at $P < 0.001$.

**Table (4):**The results in this table reveal that, there is no significant relation between the studied patients' post-operative outcomes and the time consumed during operation and use of cardiac assistive devices during operation at $P > 0.05$.

Also, it is clear from the same table that, there are highly statistically significant relations between the studied patients' post-operative outcomes and occurrence of cardiac arrest, bleeding and arrhythmias and use of cardiac inotropic drugs at $P < 0.001$.

**Table (5):** The data in this table shows the relation between the studied patients' post-operative outcomes and intra-operative factors affecting open-heart surgery. It is clear from this table that, there are highly statistically significant relations between post-operative outcomes and patients post-operative vital signs, time of regaining consciousness post-operative, ICU stay, duration of post-operative mechanical ventilation, time of chest tube removal after surgery, in addition to occurrence of post-operative cardiac arrest, bleeding, acute renal failure, infection (UTI-VAP), delayed cardiac intropic drugs discontinuation, re-intubation/ventilation, arrhythmias and use of cardiac assistive devices post-operatively at $P < 0.001$.

**Table (1):** Frequency and percentage distribution of the studied patients according to their demographic data (n=120).

| Demographic Data | No. | % |
|---|---|---|
| **Age (years)** | | |
| • <40 years | 7 | 5.8 |
| • 40 -<50 years | 29 | 24.2 |
| • 50 -<60 years | 48 | **40** |
| • ≥ 60 years | 36 | 30 |
| Mean ± SD | 54.42±7.16 | |
| **Gender** | | |
| • Female | 32 | 26.7 |
| • Male | 88 | **73.3** |
| **Level of education** | | |
| • Can't read and write | 20 | 16.7 |
| • Primary | 19 | 15.8 |
| • Secondary | 10 | 8.3 |
| • University | 71 | **59.2** |
| **Residence** | | |
| • Rural | 48 | 40 |
| • Urban | 72 | **60** |

**Table (2):** Frequency and percentage distribution of the studied patients according to their medical history.

| Medical data | No. | % |
|---|---|---|
| **BMI*** | | |
| • Under weight | 0 | **0** |
| • Normal weight | 26 | 21.7 |
| • Overweight | 84 | **70** |
| • Obese | 10 | 8.3 |
| Mean±SD | 26.87 ± 2.77 | |
| **Present medical history**:** | | |
| • HTN | 102 | **85** |
| • DM | 100 | **83.3** |
| • Heart failure | 31 | 25.8 |
| • Rheumatic fever | 18 | 15 |
| • Hyperlipidemia | 75 | 62.5 |
| • Hepatitis | 6 | 5 |
| • Acute renal failure | 5 | 4.2 |
| • Re-operation of surgery | 2 | **1.7** |
| **Past medical history **:** | | |
| • Arrhythmias | 24 | **20** |
| • Cerebrovascular Stroke (CVS) | 0 | 0.0 |
| • Cancer | 0 | 0.0 |
| • Peptic ulcer | 8 | 6.7 |
| • Smoking | 78 | **65** |
| **Maintenance drugs:** | | |
| • Anti-coagulant | 115 | **95.8** |
| • Corticosteroids | 3 | 2.5 |
| • Digitals drug | 11 | 9.2 |

***BMI: Body mass index [wt in kgs/ ht2 in meter]** Number is not mutually excluded.**

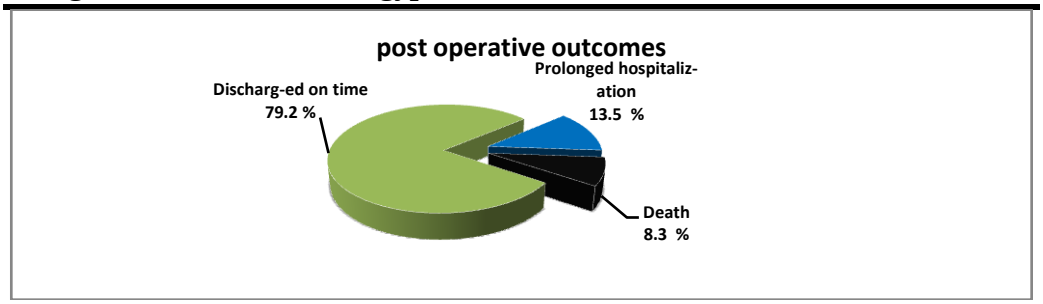


**Figure (1):** Percentage distribution of the studied patients according to their post-operative outcomes (n=120).

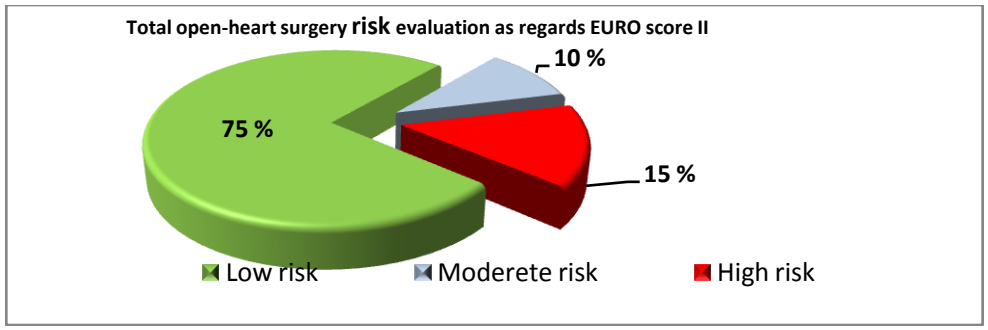


**Figure (2):** Percentage distribution of the studied patients according to their total open-heart surgery risk evaluation for death; EURO scores II.

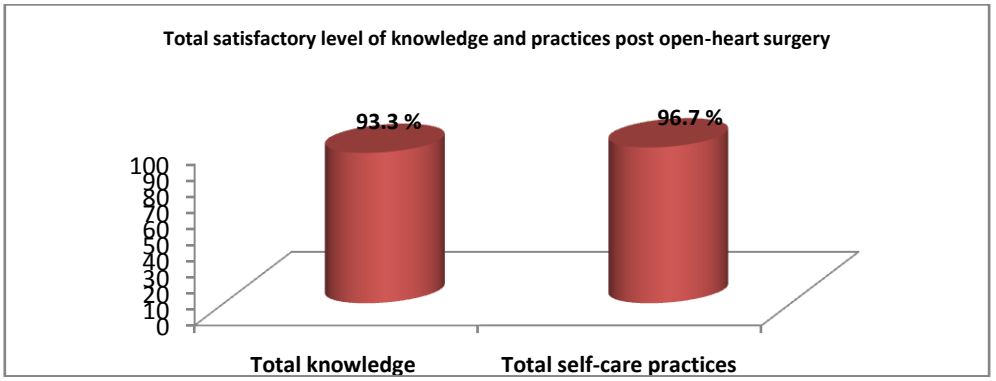


**Figure (3):** Percentage distribution of the studied patients according to their satisfactory level of total knowledge and self-care practices post open-heart surgery.

**Table (3):** Relation between the pre-operative factors affecting open-heart surgery and post-operative outcomes.

| Pre-operative assessment data | Post-operative outcomes: Discharged on time (n=95) | | Prolonged hospitalization (n=15) | | Death (n=10) | | Chi-square test | |
|---|---|---|---|---|---|---|---|---|
| | N. | % | N. | % | N. | % | $X^2$ | p-value |
| **Normal pre-operative vital signs.** | **95** | **100** | **11** | **73.3** | **6** | **60** | **34.286** | **<0.001**** |
| **Laboratory investigations** | | | | | | | | |
| Normal CBC | 90 | 94.74 | 13 | 86.67 | 9 | 90 | 1.551 | 0.461 |
| Normal kidney function test | 83 | 87.37 | 12 | 80 | 8 | 80 | 0.884 | 0.643 |
| Normal liver function test | 86 | 90.53 | 14 | 93.33 | 9 | 90 | 0.132 | 0.936 |
| Normal coagulation profile | 76 | 80 | 10 | 66.67 | 8 | 80 | 1.375 | 0.503 |
| **Pre-operative use of** | | | | | | | | |
| Cardiac inotropic drugs. | 2 | 2.1 | 3 | 20 | 7 | 70 | 48.246 | <0.001** |
| Cardiac assistive devices | 0 | 0.0 | 0 | 0.0 | 1 | 10 | 11.092 | 0.004* |

**P-value >0.05** Non significant; *** p-value ≤0.05** significant; **** p-value <0.001** Highly Significant**.**

**Table(4):**Relation between the intra-operative factors affecting open-heart surgery post-operative outcomes.

| Intra-operative assessment data | Post-operative outcomes: Discharged on time (n=95) | | Prolonged hospitalization (n=15) | | Death) (n=10) | | Chi-square test | |
|---|---|---|---|---|---|---|---|---|
| | N. | % | N. | % | N. | % | $X^2$ | p-value |
| **Time consumed during operation** | | | | | | | | |
| • <3 hours | 6 | 6.3 | 1 | 6.7 | 2 | 20 | | |
| • 3-5 hours | 32 | 33.7 | 4 | 26.7 | 2 | 20 | 5.675 | 0.461 |
| • 5-7 hours | 49 | 51.6 | 7 | 46.7 | 4 | 40 | | |
| • >7 hours | 8 | 8.4 | 3 | 20.0 | 2 | 20 | | |
| **Intra-operative incidence** | | | | | | | | |
| • Cardiac arrest. | 0 | 0.0 | 0 | 0.0 | 2 | 20 | 22.373 | <0.001** |
| • Excessive bleeding. | 0 | 0.0 | 3 | 20.0 | 3 | 30 | 25.263 | <0.001** |
| • Arrhythmias. | 7 | 7.4 | 5 | 33.3 | 8 | 80 | 37.794 | <0.001** |
| **Intra-operative use of** | | | | | | | | |
| • Cardiac inotropic drugs. | 2 | 2.1 | 0 | 0.0 | 5 | 50 | 38.845 | <0.001** |
| • Cardiac assistive devices | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0.000 | 1.000 |

**P-value >0.05** Non significance****p-value <0.001** Highly Significance**.**

**Table (5):** Relation between the post-operative factors affecting open-heart surgery and post-operative outcomes.

| Post-operative assessment data | Post-operative outcomes: Discharged on time (n=95) | | Prolonged hospitalization (n=15) | | Death (n=10) | | Chi-square test | |
|---|---|---|---|---|---|---|---|---|
| | N. | % | N. | % | N. | % | $X^2$ | p-value |
| **Normal post-operative vital signs.** | 90 | 94.7 | 12 | 80.0 | 7 | 70.0 | 44.39 | <0.001** |
| **Delay of regaining consciousness** | 5 | 5.3 | 3 | 20.0 | 3 | 30.0 | 13.25 | <0.001** |
| **Post-operative ICU stay:** | | | | | | | | |
| • <48 hours | 90 | 94.7 | 0 | 0.0 | 0 | 0.0 | | |
| • 2-4 days | 5 | 5.3 | 7 | 46.7 | 0 | 0.0 | 124.09 | <0.001** |
| • > 4 days | 0 | 0.0 | 8 | 53.3 | 10 | 100 | | |
| **Duration of post-operative mechanical ventilation** | | | | | | | | |
| • < 6 hours | 90 | 94.7 | 0 | 0.0 | 0 | 0.0 | | |
| • 6-12 hours | 5 | 5.3 | 11 | 73.3 | 7 | 70 | 96.42 | <0.001** |
| • > 12 hours | 0 | 0.0 | 4 | 26.7 | 3 | 30 | | |
| **Time of chest tube removed after surgery:** | | | | | | | | |
| • 24 hours after surgery | 92 | 96.8 | 1 | 6.7 | 2 | 20.0 | 87.02 | <0.001** |
| • More than 24 hours after surgery | 3 | 3.2 | 14 | 93.3 | 8 | 80.0 | | |
| **Post-operative occurrence** | | | | | | | | |
| • Cardiac arrest | 0 | 0.0 | 2 | 13.3 | 4 | 40.0 | 32.98 | <0.001** |
| • Excessive Bleeding | 0 | 0.0 | 3 | 20.0 | 0 | 0.0 | 21.53 | <0.001** |
| • Acute renal failure | 3 | 3.2 | 10 | 66.7 | 2 | 20.0 | 48.33 | <0.001** |
| • Surgical site infection | 3 | 3.2 | 3 | 20.0 | 1 | 10.0 | 7.034 | 0.030* |
| • Infection (UTI-VAP) | 4 | 4.2 | 9 | 60.0 | 7 | 70.0 | 51.37 | <0.001** |
| • Delay of cardiac inotropic drugs discontinuation | 3 | 3.2 | 15 | 100.0 | 10 | 100.0 | 103.75 | <0.001** |
| • Re-intubation \ Ventilation | 0 | 0.0 | 0 | 0.0 | 4 | 40.0 | 45.51 | <0.001** |
| • Arrhythmias | 7 | 7.4 | 4 | 26.7 | 8 | 80.0 | 37.32 | <0.001** |
| • Use of cardiac assistive devices | 0 | 0.0 | 0 | 0.0 | 3 | 30.0 | 33.84 | <0.001** |

***p-value ≤0.05** significance****p-value <0.001** Highly Significance**.**

## Discussion

Heart disease remains a worldwide public health problem. Coronary artery disease and valvular disorders are the most important entity of heart disorders requiring surgical intervention. Although there is obvious improvement in surgical techniques and medical management, major perioperative complications are still happen during cardiac surgery. These complications may be due to a change in the profile of patients scheduled for cardiac surgery to include extremes of age **(Hajar, 2017).**

Therefore the study aimed to assess patients' bio-demographic and specific comorbidity data, operative factors, knowledge and practices regarding self-care post open-heart surgery that may affect post open heart surgery outcomes .

This discussion will be portrayed into the following five parts: patient assessment data (Demographic data of the studied patients and medical history data of the studied patients, operative factors that may affect open-heart surgery outcomes (preoperative, intraoperative and postoperative data), patient's self-care knowledge and practices after open heart surgery and relations between study variables .

Regarding demographic data of the studied patients, the result of the present study showed that the mean age of the studied patients was 54.42 ± 7.16 years, and about three quarters of them were males. This finding was similar to ***Al-Adwan, Fadel, Al-Naser, Al Qaysi, Qsous and Al-issa (2016)*** who carried out a study entitled "Prevalence of co-morbidities among adult patients presented for open-heart surgery and the implication on convalescence period" and found that the mean age of the patients was 58 ±12 years and most of them were males.

Also, the finding is in agreement with ***Abdelnabey, Elfeky, Mohamed and Badr (2014)*** who carried out a study entitled "Readmission after Open-heart Surgery: Study of Predictors and Frequency" which found that mean age of patients was 51.77 ±13.89 years and more than two thirds of them were males.

On contrary with, ***Pietrzyk, Mitcha and Kaplon (2014)*** who carried out a study entitle "Coronary artery bypass grafting in patients over 80 years of age: a single-center experience" and found that the mean age of the patients was 81.7±4.43 years and less than two thirds of them were males .

The difference of results between previous and current study might be due to the belief in Egypt, whether between doctors or patient themselves, that performing surgery in older patients usually had incidence of postoperative complication and solving the problem either with performing therapeutic coronary angiography or conservative medical treatment are the best choices .

In relation to demographic data of the studied patients, the result of the current study revealed also that less than two thirds of the studied patients got university level of education. The findings were in contrary with ***Ribeiro, Silveira, Benetti, Gomes and Stumm (2015)*** who carried out a study entitled "Nursing diagnoses for patients in the post-operative period of cardiac surgery" which found that slightly less than two thirds of the patients got elementary school level of education.

The difference in level of education may be due to that half of the studied sample of ***Ribeiro, Silveira, Benetti,***

***Gomes and Stumm (2015)*** were farmers and salespersons.

In the same context, the result of the current study illustrated that less than two thirds of the studied patients lived in urban areas. The finding supported by ***Abdelnabey, Elfeky, Mohamed and Badr (2014)*** who carried out a study entitled "Readmission after Open-heart Surgery: Study of Predictors and Frequency" which found that slightly less than half of the studied patients lived in urban areas.

As regards the studied patients' medical history, the results revealed that less than three quarters were over-weight, most of them had HTN and DM, while less than one tenth of them were re-operated within one month from the previous surgery. The high incidence of DM and HTN in the studied patients might be associated with metabolic disorders due to increased atherosclerosis and fat accompanied with increased body mass index.

These results were similar to ***Adekolaa et al., (2017)*** who carried out a study entitled "Experience with cardiac surgery in a private tertiary hospital in Chennai, India" and found that less than two thirds of the studied sample had HTN, DM, and less than one tenth of them were re-operated within one month.

Moreover, the results disagree with ***Shinjo and Fushimi (2015)*** who carried out a study entitled "Pre-operative factors affecting cost and length of stay for isolated off-pump coronary artery bypass grafting: hierarchical linear model analysis" and found that about one third of the studied sample were overweight.

In addition, as regards medical history, this present study found that nearly two thirds of the studied patients were smokers and one fifth of them had past history of incidence of arrhythmias. These results might be due to the fact that smoking is a major risk factor for the heart diseases that carries with it high incidence of arrhythmias.

These results is supported by ***Tribuddharat et al., (2014)*** who carried out a study entitled "Development of an Open-Heart Intra-operative Risk Scoring Model for Predicting a Prolonged Intensive Care Unit Stay" and revealed that about one third of the studied sample had history of atrial fibrillation as the most common arrhythmia occurs with heart disorders .

Moreover, the results were similar to ***Shinjo and Fushimi (2015)*** who carried out a study entitled "Pre-operative factors affecting cost and length of stay for isolated off-pump coronary artery bypass grafting: hierarchical linear model analysis" and found that less than two thirds were smokers.

The patients' outcomes of open heart surgery during hospitalization are classified according to ***MacGill (2018)*** into following categories: discharge within 7-10 days starting from day of admission, or incidence of major complications leading to prolonged ICU and hospital stay, or death.

Regarding post-operative outcomes of the studied patients, the result of the current study showed that the most of the studied patients were discharged on time and more than one tenth of them had prolonged hospitalization and less than one tenth of them were died. This might be attributed to advances in technologies and new operative techniques which increases the rates of successful operations and also decreases the incidence of undesired adverse events.

The results agreed with ***Adekolaa et al., (2017)*** who carried out a study entitled "Experience with cardiac surgery in a private tertiary hospital in Chennai, India" and found that less than one tenth of the studied sample were died.

Moreover the results were also in agreement with ***Nashefa et al., (2012)***who carried out a study entitled "EURO score II" and found that majority of the studied sample were discharged within one week after the surgery .

As regards total open-heart surgery risk evaluation, the results of current study showed that three quarters of the studied patients were at low risk for death while less than one fifth were at high risk for death. The results may be due to majority of the studied sample had stable preoperative state and less comorbidities before surgery as most of cases are planned cases.

In the same line, ***Nashefa et al., (2012)*** who carried out a study entitled "Euro SCORE II" found that less than one quarter of the sample were at high risk for death.

Regarding the satisfactory level of total knowledge post open-heart surgery among the studied patients; the results of this study revealed that majority of the studied patients had satisfactory level of knowledge. This results were at contrary to the findings of ***Rankinen et al., (2007)***who carried out a study entitled "Expectations and received knowledge by surgical patients" who illustrated that most of the patients need improvement in their education post-operative, as three quarters of ***Rankinen et al., (2007)*** studied sample got primary and secondary level of education.

As regards the level of total practices post open heart surgery; the results of current study showed that majority of the studied patients had satisfactory total level of practices post open heart surgery. The results was supported with ***Westerdahl and Möller (2010)*** who carried out a study entitled "Physiotherapy-supervised mobilization and exercise following cardiac surgery: a national questionnaire survey in Sweden" and found that the majority of the studied patients undergo routine early mobilization and shoulder range of motion exercises during the first postoperative days and more exercises during the following days.

Moreover, the results were in agreement with ***Ahmed, Ibrahim, El Soussi and El Said (2006)*** who carried out a study entitled "The effect of early activity on patients outcome after open heart surgery" and found that early mobilization and chest physiotherapy improves overall respiratory condition and shorten the ICU stay period.

This might be referred to the improvement of the patients' outcome including pulmonary functions and cardiovascular stability that lead to rapid recovery and early discharge.

This explanation is supported by ***Black, Jacobs (2001)*** who mentioned that postoperative ambulation, improving ventilation,, early extubation, encouraging patients to walk and use of preoperative and postoperative breathing exercises improves overall lung functions which decease the mechanical ventilation time and ICU stay .

According to current study, the outcomes for patients' post open heart surgery during hospitalization are discharge on time, prolonged hospitalization and death; and in the

following part we are discussing the relation between the demographic data and patient history data, operative data (Preoperative, Intraoperative and Postoperative), Euro score II, and patient knowledge and self-care practices post open heart surgery in relation to these outcomes .

Regarding the relation between the pre-operative factors affecting open-heart surgery and post-operative outcomes, the results of this study revealed that there was significant relation between post-operative outcomes and the use of cardiac assistive devices pre-operatively. Moreover, there were highly statistically significant relations between the studied patients' post-operative outcomes and their pre-operative vital signs and use of inotropic drugs. The researcher point of view is that use of cardiac inotropic drugs and unstable vital signs usually associated with preoperative critical state and uncontrolled hemodynamics which is associated with prolonged ICU stay and even death .

This explanation is supported by ***(Zellinger 2013)*** who mentioned that cardiac inotropic drugs are used before surgery for patients who present with cardiogenic shock and postoperatively with low cardiac output syndromes which are considered very critical conditions .

These findings were similar to ***Diepen, Graham, Nagendran and Norris, (2014)*** who carried out a study entitled "Predicting cardiovascular intensive care unit readmission after cardiac surgery" and found that death was associated with insertion of pacemaker postoperatively, while, controlled hemodynamics were associated with prolonged ICU and overall hospital stay.

As regards the relation between the intra-operative factors affecting open-heart surgery and post-operative outcomes, the results revealed that, there were no significant relation between the studied patients' post-operative outcomes and the time consumed during operation and use of cardiac assistive devices during operation. while, there were highly statistically significant relations between the studied patients' post-operative outcomes and occurrence of cardiac arrest, use of cardiac inotropic drugs, occurrence of excessive bleeding and arrhythmias intraoperatively . The results agree with ***Hsin-Jung, Chien-Chuan, Kuang-Yi, (2011)*** who carried out a study entitled" Patients and surgery-related factors that affect time of recovery in adult patients undergoing elective surgery" and found that increase time of operation had a negative effect on regaining consciousness post-operatively and overall the patient outcomes.

Moreover, the results of present study are supported by ***Shinjo and Fushimi (2015)*** who carried out a study entitled "Pre-operative factors affecting cost and length of stay for isolated off-pump coronary artery bypass grafting: hierarchical linear model analysis" and found that cardiac arrhythmias, bleeding and cardiac insult needs Cardiopulmonary Resuscitation 'CPR' post-operatively are factors associated with increase length of hospital stay. The researcher believed that low incidence of intraoperative use of cardiac assistive devices, inotropic drugs and incidence of excessive bleeding in this study may be strongly related to the proper preoperative preparations and also most of cases are planned cases .

Concerning the relation between the post-operative factors affecting open-heart surgery and post-operative outcomes, the results showed that there were highly statistically significant relations between post-operative outcomes and 1st 24 hours post-operative vital signs, time of regaining

consciousness post-operative, post-operative ICU stay, duration of post-operative mechanical ventilation, time of chest tube removal after surgery, in addition to occurrence of post-operative cardiac arrest, bleeding, acute renal failure, infection (UTI-VAP), delayed cardiac intropic drugs discontinuation, re-intubation/ventilation, arrhythmias and use of cardiac assistive devices post-operatively .

These results could be related to most of patients with postoperative complications were highly risk patients as they had multiple comorbidities and these comorbidities are the underlying cause for such complications.

This explanation was in agreement with ***Kaplow, Hardin, Hardin-Wike and McMurry (2013)*** who mentioned that most of morbidities and mortalities after cardiac surgeries are associated with risk factors in the preoperative period as smoking, diabetes mellitus, Chronic airway disease previous cardiac surgery, recent myocardial infarction Low left ventricular ejection fraction chronic heart failure, obesity, procedure urgency, critical preoperative condition, dialysis

The results was supported with ***Silberman, Bitran, Fink, Tauber and Merin (2013)*** who carried out a study entitled " Very Prolonged Stay in the Intensive Care Unit After Cardiac Operations: Early Results and Late Survival" and found that most of patients mortality within 2 weeks of cardiac surgery were related to prolonged ICU stay, prolonged mechanical ventilation, sepsis and postoperative renal function deterioration .

## Conclusion

***Based on the findings of this study, the researcher concluded that:***

The mean age of the studied patients was slightly above fifty. Most of the patients under study had medical history of Hypertension and Diabetes Mellitus and more than two thirds were overweight. Regarding the factors affecting open heart surgery outcomes among patients under study, the current study concluded that preoperative vital signs, use of preoperative cardiac inotroptic drugs and cardiac assistive devices, intraoperative use of cardiac inotroptic drugs in addition to postoperative vital signs, delay of regaining consciousness, postoperative ICU stay, duration of postoperative mechanical ventilation, time of chest tube removal and occurrence of postoperative complications; were the most significant factors affecting outcomes. Also, the majority of the studied patients got satisfactory level of knowledge and self-care practices regarding post open heart surgery .

## Recommendations

**The result of this study projected the following recommendations**:

- Scheduled visits for assessment of the patients before the scheduled surgery to evaluate the health state and modify preoperative factors that could affect the outcomes.
- Determining the high risk patients and allow close hospital observation and close follow up before, during and after the surgery.
- Prepare self-instructional booklets including information regarding the preoperative preparations until patient's discharge.
- Establish a website to give instructions about open heart surgery for

the patients undergoing the open heart surgery.

- Further studies will be needed to modify factors affecting outcomes and improve outcome of patients undergoing open heart surgery.

## References

**Abdallah, F.A. (2012):** "Neuropshychiatric complications after cardiac surgery" Faculty of Medicine, Alexandria university. Journal of Biology. Agriculture and Health care Vol.4, No.7.

**Abdelnabey R.A., Elfeky HA, Mohamed WY, Badr SA (2014):** Readmission after Open-heart Surgery: Study of Predictors and Frequency**,** Journal of Biology, Agriculture and Healthcare Vol.4, No.7.

**Adekolaa O, Ogunleyeb E, Kurienf J, Josephc A, Ajayid O, Ojoe O and Cherianf S (2016):** Experience with cardiac surgery in a private tertiary hospital in Chennai, India, The Egyp J. Cardthorac. Anesth., Vol. 10, No. 1.

**Ahmed H, Ibrahim Y, El Soussi A and El Said M (2006):** The Effect of Early Activity On Patients Outcome After Open Heart Surgery AJAIC-Vol. 9, No. 3.

**Al-Adwan H, Fadel A, Al-Naser YF, Al Qaysi A, Qsous R and Al-issa I (2016):**Prevalence of co-morbidities among adult patients presented for open-heart surgery and the implication on convalescence period, International Journal of Advances in Medicine. Int J Adv Med Vol. 4, No. 1.

**Black & Jacobs (2001):** Medical-surgical nursing: Clinical management for continuity of care. 6th ed. Philadelphia: W.B. Saunders Company. 2001; pp. 480, 492.

**Capdeville M, Lee JH, Taylor AL (2011):** Effect of gender on fast-track recovery after coronary artery bypass graft surgery. J CardiothoracVascAnesth, Vol. 15, No. 2.

**Diepen S, Graham M, Nagendran J and Norris C (2014):** Predicting cardiovascular intensive care unit readmission after cardiac surgery: derivation and validation of the Alberta Provincial Project for Outcomes Assessment in Coronary Heart Disease (APPROACH) cardiovascular intensive care unit clinical prediction model from a registry cohort of 10,799 surgical cases, Critical Care, Vol. 18, No. 6.

**European system for cardiac risk stratification (2011):** Accessed at: http://www.euroscore.org. Retrieved at: 1 May, 2019.

**Hajar (2017):** Coronary heart disease: From mummies to 21st century Heart view j. Vol. 17, No. 2.

**Hsin-Jung T, Chien-Chuan C, Kuang-Yi C (2011): Patients and surgery-related factors that affect time to recovery of consciousness in adult patients undergoing elective cardiac surgery Journal of the Chinese Medical Association, Vol. 74, No. 8.**

**Kaplow R, Hardin SR, Hardin-Wike B and McMurry TE (2013):** Preoperative Cardiac Surgery Nursing Evaluation. Jones and Bartlett Publishers, LLC, ed2nd , Ch. 4, United States of America.

**MacGill M (2018):** What should I expect during open heart surgery?**.**Accessed at: https:// www.Medical newstoday.com /articles/312888.php.Retrivedat:2 Jan, 2019.

**Myles PS, Devereaux PJ. (2010):** Pros and cons of composite endpoints in anesthesia trials. Anesthesiology., Vol. 113, No. 4.

**Nashefa S, Roquesb F, Sharplesc L, Nilssond J, Smitha, Goldstonee A and Lockowandtf U (2012):** EuroSCORE II: Euro J. CardThorac Surg., Vol. 41. No. 9.

**Pietrzyk, Mitcha and Kaplon (2014):** Coronary artery bypass grafting in patients over 80 years of age: a single-centre experience. Kardiol Pol. Vol.72, No.7.

**Rankinen S, Salanterä S, Heikkinen K, Johansson K, Kaljonen A, Virtanen H, Leino-Kilpi H. (2007):** Expectations and received knowledge by surgical patients. Int J Qual Health Care., Vol. 19, No. 2.

**Ribeiro CP, Silveira CO, Benetti ER, Gomes JS and Stumm MF (2015):** Nursing diagnoses for patients in the post-operative period of cardiac surgery. Retrieved at: 11, April 2019.

**Shinjo D. & Fushimi K. (2015):**Pre-operative factors affecting cost and length of stay for isolated off-pump coronary artery bypass grafting: hierarchical linear model analysis. BMJ., Vol. 5, No. 11.

**Silberman S, Bitran D, Fink D, Tauber R, Merin O. (2013**): Very prolonged stay in the intensive care unit after cardiac operations: early results and late survival Ann Thorac Surg., Vol. 96, No. 1.

**Tribuddharat S, Sathitkarnmanee T, Ngamsangsirisup K, Charuluxananan S, Hurs T, Silarat S, and Lertmemongkolchai G (2014):** Development of an Open-Heart Intra-operative Risk Scoring Model for Predicting a Prolonged Intensive Care Unit Stay BioMed Research International Vol. 2014, No. 19.

**Westerdahl E, Möller M (2010):** Physiotherapy-supervised mobilization and exercise following cardiac surgery: A national questionnaire survey in Sweden. J Cardiothorac Surg., Vol. 5, No. 67.

**Zellinger M (2013):** Hemodynamic Monitoring. Jones and Bartlett Publishers, LLC, ed2nd , Ch. 8, United States of America.