International Egyptian Journal of Nursing Sciences and Research
(IEJNSR)

Original Article

Effectiveness of Supine versus Semi-fowler Positioning on Physiological Indices among Patients Post Coronary Artery Bypass Graft Surgery

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Abstract

Background: Coronary artery bypass graft considered one of the most common surgical procedures that are performed worldwide to treat complications for patients with ischemic heart disease. Appropriate positioning of the patient post cardiac surgery cans dramatically improved blood oxygenation, prevent atelectasis and improve the hemodynamic status. **The aim of this study** was to evaluate the effect of supine versus semi-setting positioning on physiological indices among patients' post-CABG. **Design:** A quasi-experimental research design was utilized. **Setting:** Surgical ICU at International Educational Hospital in Tanta University Hospitals, Egypt. **Subjects:** A purposive sample of (80) patients was enrolled in the current study and dividid equally into supine and semi-fowler groups. **Tools:** Two tools were used to collect data; **Tool (I):** Patient's bio-socio-demographic data and **Tool (II):** Cardiorespiratory parameters. **Results:** The study findings revealed that there was statistically significant improvement regarding total mean scores of respiratory rate, PaO2, $PaCO_2$, and SpO_2 among patients in semi-setting than the supine group in which $P < 0.05$**. Conclusion: it was concluded that** the application semi-setting positions for patient's post coronary artery bypass graft had a significant positive improvement of physiological indices especially respiratory parameters compared to supine position. It is recommended that semi-setting positioning should be integrated into routine care for critically ill patients post-CABG.

Keywords: Coronary artery bypasses graft, Physiological indices, Supine versus semi-setting and Positioning

Introduction

Coronary Artery Bypass Graft (CABG) is one of the most commonly performed major surgical procedures that are conducted frequently every day worldwide to relieve symptoms and reduce the risk of death for patients with ischemic heart disease and is the preferred treatment for patients suffering from multi-vessel coronary artery disease (CAD) **(Kashani et al., 2021, Melly et al ., 2018& Solo et al. 2019)**. Average incidence rate of CABG surgery in western European countries is 62 per 100,000 inhabitants and volumes of nearly 200,000 patients in the United States (**Jan et al., 2021).**

Despite, CABG is done to decline the patients' suffering but they may have several complications post CABG surgery. The most common complications include hemodynamic instability as changes in and pulse rate and blood pressure, consequently leading to an increase in myocardial oxygen consumption and ischemia. Also, hypoxia, abnormal changes of ventilation-perfusion ratio (V/Q), partial pressure of oxygen in arterial blood (PaO_2),partial pressure of carbon dioxide in arterial blood ($PaCo_2$), and myocardial infarction, hemorrhage, dysrhythmias, pericarditis, embolism, and hemothorax **(Pooria et al., 2020& Sania et al., 2022)** Additionally, Therefore, suitable therapeutic different positioning such as supine, semi setting, and lateral position is considered a simple preventive therapy for these complications(**Kashani et al., 2021& Bozgüney et al., 2021)**

Additionally, positioning is one of the foremost nursing procedures performed by the nurse in the intensive care areas to enhance circulation, and promote pulmonary gas exchange, fundamentally by controlling the impact of gravity on cardiovascular and cardiopulmonary function **(Melly et al., 2018& Simon et al., 2019**). Moreover, different degrees of body positioning are selected to improve the physiological indices such as as heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygenation parameters such as respiratory rate, pH, PaO2, PaCO2, and arterial blood oxygen saturation (SpO_2). Moreover, post-operative management for CABG patients promptly needs early mobilization and change of position because these patients ought to spend an extent of time on a certain position well forwards during which the decrease diaphragm pressure. Compared to supine this position not only increases lung volume but also decrease work of breathing and improves gas exchange **(Barkhordari-Sharifabad & Zerang, 2021)**.

Moreover, semi-fowler position a sgnificantly associated with an improvement of oxygenation parameters by increasing SpO_2, PaO_2, and decreasing $PaCo_2$ and favors clearance of respiratory secretions, prevention of pressure sores **(Saha et al., 2020, Barkhordari-Sharifabad & Zerang, 2021, Ambrosetti et al., 2021**). Therefore, the critical care nurse should evaluate patient’s positioning and make independent clinical judgments about optimal

positions to preserve or improve functions and cerebral oxygenation **(Barkhordari-Sharifabad & Zerang, 2021, Ambrosetti et al., 2021**). Therefore, this study was done to clearly show the effect of supine versus semi-setting positioning on physiological indices among patients post coronary artery bypass graft surgery.

Significance of the study:

Findings of the effect of body position on physiological indices among patients post-CABG surgery are clashing which suggests that the effectiveness of therapeutic position on patients is not clear. Decline of clarity regarding this feature is a problem for nurses that hinders the delivery of effective care and the solution focus on increase awareness of the significance of positioning on short and long-term patient outcomes **(Ebrahim et al., 2017).** Positioning for patients post-CABG surgery such as supine and semi sitting may be selected to provide a therapeutic benefit which includes; enhance arterial blood oxygenation, preventing atelectasis, and gathering of mucus that improve care unit while facilitating recovery.

The aim of this study was to:

Evaluate the effectiveness of supine versus semi-fowler positioning on physiological indices among patients post coronary artery bypass graft surgery.

Research hypothesis:

To achive the purpose of this study, the research hypothesis include, patients who are positioned in semi-fowler position exhibit an improvement of cardiac and respiratory indices such as systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), heart rate (HR), peripheral oxygen saturation, and arterial blood gases results as PaO2 and PaCo2 than the supine position post coronary artery bypass graft.

Subjects and Method:

Research design:

A quasi-experimental research design was used in the current study.

Study Setting:

The Surgical ICU at International Educational Hospital in Tanta University Hospitals is affiliated to Ministry of Higher Education and Scientific Research, Egypt. It is prepared and equipped with one word which includes 9 beds.

Sample:

A purposive sample of 80 patients after CABG surgery was included in this study. Sample size was estimated using the Epi Info Software Statistical package prepared by the World Health Organization and the Center for Disease Control and Prevention, Atlanta, Georgia, USA, version 2002 using the following parameters:

The total patients admitted per year according to review of Tanta University Hospitals statistical records in 2021 were 210 patients, confidence level= 99.9%, expected frequency= 50%,

accepted error= 5% and confidence coefficient =95%. The accepted sample size was 80 patients.

The Sample will be distributed to two equal groups 40 patients in each group as the following:

Supine group: It was consisted of 40 adult patients who placed in supine position.

Semi-fowler group: It was consisted of 40 adult patients who placed in semi-fowler position.

The inclusion criteria were; adult patients aged 21-60 years of both sexes, patients who had normal values of the physiological indices befor the study and expected to stay at least 48 hours post surgery.

The exclusion criteria included; patients who experience compromising arrhythmia.

Tool of data collection :

Two tools were utilized to collect data based on reviewing of the relevant literatures as the following:

Tool (I): Patient's Bio socio-demographic data: This tool was developed by the researcher post reviewing the relevant literature **(Ramazani 2017, Ambrosetti et al., 2021, Sania et al., 2022)**to assess patients' Socio-demographic characteristics and medical data .It included 2 parts as the following:

Part (A): Patients' Socio-demographic characteristics which included; the patient's code, age, gender, marital status, level of education, occupation, and smoking habits.

Part (B): Patients' medical data: It was used to assess patients' diagnosis, past medical and surgical history.

Tool II: Patients' Physiological indices schedule: This tool was developed by the researcher post reviewing the relevant literature **(Bozgüney et al., 2021& Zerang et al., 2022)** to assess patients' cardiac and respiratory indices or parameters. It included two parts as the following:

Part (A): Patients' cardiac indices; this part was used to assess heart rate, systolic and diastolic blood pressure, and mean arterial blood pressure.

Part (B): Patients' respiratory indices; it was used to assess oxygenation and respiratory parameters which include; respiratory rate, PaO_2, $PaCo_2$, and SaO_2.

Method:

Administrative process:

Prior to conducting this study, official approval was obtained from the International Educational Hospital Surgical Intensive Care Unit Regulatory Authority.

- Ethical consideration

Written/oral consent was obtained from the patients or their relatives after they were explained the details of the various non-invasive tests to be conducted to participate in the study. The researchers explained to the patients and their families that participation in this study is voluntary and they can withdraw from the study

at any time without penalty. They were informed about the confidentiality of data collection and privacy was maintained. A code number was used instead of names. The nature of the questionnaires did not cause any physical or mental harm to the participants.

- **Tools development:** All the tools were developed by the researchers based on a review of the relevant literature.
- All study tools were tested for content validity by five experts; (3) critical care nursing specialists, (1) anesthesiologist, and (1) biostatistics to ensure validity.
- All study tools were tested for reliability and the Cronbach alpha technique was used and found to be 0.950 of too 1 and tool II.
- A pilot study was performed on (8) patients accordingly and the needed modification was done.
- This study was conducted from the beginning of Jun to the end of November 2022.

Data collection procedures were done using four phases; assessment, planning, implementation, and evaluation.

Phase I: Assessment Phase:

The assessment phase was done for all patients to collect patients' socio-demographic data and clinical data from the patient's records using Tool I.

Phase II: Planning Phase:

It was developed based on the literature review, assessment phase, priorities, goals and expected outcome criteria were considered when planning patient care. The expected outcomes included comparing changes of both oxygenation and cardiac indices for patients in supine versus semi-fowler positioning.

Phase III:Implementation Phases:

- In this phase the patients of study group I were placed in semi-fowler position for 2 hours, then 30 minutes resting period was taken to allow the patient to return to comfortable state. On the other hand, the patients of study group II were placed in supine for 2 hours, then a 15-minute rest period was taken.
- The respiratory and cardiac indices of patients of both study group I and II were measured and recorded every 2 hours during the morning and afternoon shifts and the total mean scores was calculated.
- No therapeutic maneuver was performed during the period of study in order not to affect patients respiratory and cardiac indices.

The implantation of both sitting and supine positions was done as the following:

A. Preparation of the patients:

- Explain to the patient the steps, why his position was changed and how this happens. Affinity with understanding had made them more likely to maintain the new position.
- Encourage the patient to help as much as possible. Decide whether the client can help in whole or in part.

- Check the chest and mediastina drainage tubes to make sure they are open and in place.

B. Supine positioning:

- In this supine position, patient legs may be extended or slightly bent with arms up or down.
- The patients were initially placed in a supine position was maintained for 30 minutes until stabilization occurred.
- During this position head of the bed eleveted at 15-30 degree .
- Small pillows can be placed under the head up to the lumbar curve. Heels must be protected from pressure through a cushion or ankle roller.
- During this position if the patient felt discomfort or unstable hemodynamic status, the patient would be returned to the comfortable resting position and would be excluded from the study.
- Respiratory and cardiac indices were monitored post 2 hours before resting period and recorded by researcher.
- Blood sample of arterial blood gas was drawn through arterial line. The sample drawn from patients was analyzed via a blood gas analyzer (**Ebrahim et al., 2016& Bozgüney et al., 2021).**

C. Semi-fowler positioning:

- During this position the head of the bed is elevated at 45 degree.
- Respiratory and cardiac indices were monitored after 2 hours before resting period and recorded by researcher.
- Blood sample of arterial blood gas was drawn through arterial line (**Bozgüney et al., 2021 Zerang et al., 2022).**

Phase IV: Evaluation phase:

Evaluation of respiratory and cardiac indices among patients post coronary artery bypass graft in supine and semi-fowler position were done using tool II. This was done every 2 hours during the morning and afternoon shifts and the total mean scores was calculated separately.

Statistical analysis:

All data were collected, coded, tabulated and subjected to statistical analysis. The statistical evaluation is carried out with the statistics package SPSS general (version 20), Microsoft Office Excel was used for the graphic representation of the variables. The data were expressed as numbers and percentages. The F-test was utilized to evaluate significance for numeric variables. the p-value of 0.01 was assumed as the significance level.

Results:

Table (1): Percentage distribution of the studied patients in both groups according to Socio-demographic data. the table revealed that more than half (50 % and 52.5%) and (60.0% and 55.0%) of the studied patients in both supin and semi-fowler groups were in the age group from 30 to ≤ 40 years and males respectively. Regarding educational level, it was noticed that more than one-third(40%) of studied patients in supine

group had a Bachelor degree, while less than one-third(30%) of studied patients in semi-fowler group had Diploma degree. Regarding, previous smoking habits, more than two-thirds (72.5% and 80.0%) of studied patients in both supine and semi-fowler groups were smokers respectively.

Table (2) illustrates percentage distribution of the studied patients in both groups according to past medical and surgical history. It was noted that the biggest common co-morbidities (40.0% and 45.5%) among patients of both groups was hypertension, while the least common co-morbidities (5.0% and 2.5%) among patients of both groups was chronic renal diseases respectively. Regarding surgical history, nearly one fifth of the studied patients of both groups had piles respectively, while only 5.0% of the studied patients in supine group had inguinal and umbilical herniotomy and only 2.5% of the studied patients in semi-fowler group had inguinal herniotomy.

Table (3) illustrates the mean scores of cardiac indices among patients of both studied groups**.** It was stated that there were no significant statistically differences regarding temperature, pulse, systolic and diastolic blood pressure among the studied patients in both supine and semi-fowler groups**.**

Table (4) illustrates total mean scores of respiratory indices among patients of both studied groups. This finding illustrated that there were significant statistical differences regarding respiratory rate, PaO2, and SaO2 among where p value <0.05. Conversely, there was no significant statistical difference was observed regarding PaCO2 among the studied patients in both supine and semi-fowler groups with P> 0.05.

Table (5) reveals correlation between socio-demographic data and cardiac parameters between patients of supine position. This table clarified that there was a significant positive correlation between age with temperature and pulse among the studied patients in supine group at a p-value < 0.05. Additionally, there was a positive significant correlation between education and pulse among the studied patients in supine at p value < 0.05. On the contrary, there were statistically significant negative correlations between past medical history and cardiac parameters; temperature and pulse and blood pressure among the studied patients in supine at p value > 0.05. Also, there were statistically significant negative correlations between occupation and cardiac parameters; temperature and pulse and blood pressure among the studied patients in supine at p value > 0.05.

Table (6) presented the correlation between socio-demographic data and respiratory indices among patients on supine positioning. It was showed that there was a significant negative correlation between age and PaCO2 among the studied patients in supine at p value < 0.05. On the contrary, there were positive statistically significant correlations between past medical history with respiration and HCO3 among the studied patients in supine at p value in which p

value less than 0.05. In addition, there was a highly positive statistically significant correlation between education with respiration and PH in which p value less than 0.05.

Table (7) reveals correlation between socio-demographic data and cardiac parameters between patients of semi-fowler position. This table clarified that there was a positive statistically significant correlation between age and diastolic blood pressure among the studied patients in semi-fowler group at a p-value < 0.05. Additionally, there was a positive statistically significant correlation between education and diastolic blood pressure among the studied patients in semi-fowler in which p value less than 0.05.

Table (8) presented the correlation between socio-demographic data and respiratory indices among patients on semi-fowler positioning. It was observed that there were significant statistical positive correlations between age with PaCO2 and HCO3 among the studied patients in semi-fowler at p value < 0.05. Also, there were significant positive correlations between education with PH and HCO3 among the studied patients in semi-fowler at p value < 0.05. Additionally, there was a positive correlation between occupation and respiration among the studied patients in semi-fowler at p value < 0.05.

Table (1): Percentage distribution of the studied patients in both groups according to Socio-demographic data

Socio-Demographic Characteristics		Supine group (n=40)		Semi-fowler group (n=40)	
		n	%	n	%
Age (years)	30- <40	20	50.0	21	52.5
	40- < 50	12	30.0	12	30.0
	≥ 50	8	20.0	10	25.0
Mean ± SD		**41.80±12.058**		**40.21±11.075**	
Sex	Male	24	60.0	22	55.0
	Female	16	40.0	18	45.0
Marital status	Married	30	75.0	33	0.45
	Single	2	5.0	4	10.0
	Widow	8	20.0	3	7.5
Education	Illiterate	8	20.0	7	17.5
	Read and write	6	15.0	6	15.0
	Diploma	10	25.0	12	30.0
	Bachelor	16	40.0	5	12.5
Occupation	No work	2	5.0	5	12.5
	Manual work	16	40.0	11	27.5
	Employed	12	30.0	15	37.5
	Housewife	8	20.0	9	22.5
	Student	2	5.0	0	0.0
Previous smoking habits	Yes	29	72.5	32	80.0
	No	11	27.5	9	22.5

Table (2): Percentage distribution of the studied patients in both groups according to past medical and surgical history

Patients' past history	Supine group (n=40)		Semi-fowler group (n=40)	
	n	%	n	%
Past medical history:				
- Hypertension	16	40.0	18	45.0
- Chronic renal diseases	2	5.0	1	2.5
- Asthma	2	5.0	4	10.0
- DM	4	10.0	6	15.0
- Stroke	2	5.0	2	5.0
- Rheumatic heart diseases	2	5.0	0	0.0
Surgical history:				
- Inguinal herniotomy	2	5.0	1	2.5
- Umbilical herniotomy	2	5.0	0	0.0
- Total hip replacement	3	7.5	5	12.5
- Piles	8	20.0	9	22.5
- appendectomy	7	17.5	10	25.0

Table (3): Mean scores of cardiac indices among patients of both studied groups

Patients' cardiac indices		Supine group	Semi-fowler group	F	P
		Mean ± SD	Mean ± SD		
Temperature		37.56±0.7410	37.70±0.6969	0.370	0.774
Pulse		89.70±17.59	89.70±14.08	0.070	0.976
Blood pressure	**Systolic**	134.65±20.04	127.70±18.40	1.882	0.135
	Diastolic	81.50±12.51	75.10±11.97	2.237	0.086
Mean arterial pressure		98.1±1.8	99±0.79	1.690	0.091

* Significant at P <0.05.

Table (4): Total mean scores of respiratory indices among patients of both studied groups

Patients' respiratory indices	Supine group	Semi-fowler group	F	P
	Mean ± SD	Mean ± SD		
Respiratory rate	18.55±3.27	20.05±3.02	2.475	0.040*
PaCO2	39.68±6.63	37.74±5.10	1.610	0.189
PaO2	93.73±5.80	97.00±2.07	2.753	0.045*
SaO2	22.36±3.90	24.20±3.13	2.736	0.046*

PaCO2: Partial pressure of carbon dioxide in arterial blood

PaO2: partial pressure of oxygen in arterial blood

SaO2: Arterial blood oxygen saturation *** Significant at P <0.05.**

Table (5): Correlation between socio-demographic data and cardiac parameters among patients of supine position.

Patients' cardiac indices		Supine group							
		Socio-demographic data							
		Age		Past medical history		Education		Occupation	
		r	p	r	p	r	p	r	p
Temperature		0.979	0.004*	-0.006	0.972	-0.262	0.102	-0.032	0.844
Pulse		0.782	0.045*	-0.080	0.623	0.344	0.030*	-0.189	0.244
Blood pressure	**Systolic**	0.212	0.188	-0.172	0.289	0.204	0.207	-0.035	0.832
	Diastolic	0.118	0.467	-0.103	0.526	0.086	0.598	-0.140	0.388

*Correlation is significant at the 0.05 level.

Table (6): Correlation between socio-demographic data and respiratory indices among patients on supine positioning

Patients' respiratory indices	Supine group							
	Socio-demographic data							
	Age		Past medical history		Education		Occupation	
	r	p	r	p	r	p	r	p
Respiration	-0.160	0.325	0.811	0.039*	0.461	0.003**	-0.139	0.393
PH	-0.073	0.655	-0.269	0.093	0.334	0.035*	-0.076	0.639
PaCO2	-0.327	0.039*	-0.190	0.240	-0.098	0.546	0.021	0.896
PaO2	0.220	0.172	0.164	0.311	0.104	0.521	0.287	0.073
HCO3	-0.133	0.415	0.315	0.048*	0.180	0.267	0.149	0.360

PaCO2: Partial pressure of carbon dioxide in arterial blood

PaO2: partial pressure of oxygen in arterial blood **SaO2:** Arterial blood oxygen saturation

*Correlation is significant at the 0.05 level. ** Correlation is highly significant at the 0.01 level.

Table (7): Correlation between socio-demographic data and circulatory parameters among patients of semi-fowler position.

Patients' cardiac indices		Semi-fowler group							
		Socio-demographic data							
		Age		Past medical history		Education		Occupation	
		r	p	r	p	r	p	r	p
Temperature		0.056	0.733	0.207	0.199	0.026	0.873	0.179	0.268
Pulse		0.023	0.887	-.065	0.689	-0.168	0.300	-0.059	0.716
Blood pressure	Systolic	0.312	0.050	0.047	0.773	0.256	0.111	0.019	0.907
	Diastolic	0.365	0.021*	0.020	0.904	0.321	0.044*	-0.041	0.800

*Correlation is significant at p value < 0.05 level

Table (8): Correlation between socio-demographic data and respiratory indices among patients of semi-fowler positioning.

Patients' respiratory indices	Semi-fowler group							
	Socio-demographic data							
	Age		Past medical history		Education		Occupation	
	r	p	r	p	r	p	r	p
Respiration	-0.009	0.954	0.147	0.365	-0.085	0.603	0.362	0.022*
PH	0.248	0.123	-0.063	0.701	0.347	0.028*	0.261	0.104
PaCO2	0.411	0.008**	-0.071	0.662	0.064	0.695	-0.178	0.273
PaO2	0.175	0.279	0.229	0.156	-0.021	0.897	0.274	0.087
HCO3	0.333	0.036*	-0.261	0.103	0.382	0.015*	0.129	0.428

PaCO2: Partial pressure of carbon dioxide in arterial blood

PaO2: partial pressure of oxygen in arterial blood **SaO2:** Arterial blood oxygen saturation

*Correlation is significant at p value < 0.05 level

**Correlation is highly significant at p value < 0.01 level

Discussion

Cardiopulmonary distrbuances are the most common problem after coronary artery bypass grafting surgery and contribute significantly to increase postoperative short and long-term complications. Therefore, the improvement of respiratory and circulatory indices are the major objectives in the postoperative period for coronary artery bypass grafting patients. So, this study evaluates the effectiveness of supine versus semi-setting positioning on physiological indices among patients' post-CABG **(Ebrahim et al.,2017& Kashani et al 2021)**.

As concern of socio-demographic data of the studied participants, The study results revealed that more than half of the participants in both groups were in the **age group** from 30 to ≤ 40 years and males. This may be due to cultural impact and the exposure of men to tobacco smoking and alcoholism than women. Moreover, three-quarters of participants were married and nearly half of them had higher education. Regarding, **previous smoking habits**, more than two-thirds of patients in supine and semi-fowler groups were smokers.

These results were consistent with **Zamzam et al., (2015)** mentioned that the mean age of the patients in critical care unit was 58.47±8.2 years and the majority of whom were male. Additionally, **Awad A'elamgied Salime et al., (2021)** stated that fewer of participated patients

with coronary artery bypass graft surgery were females.

Regarding past medical history, it was found that the biggest common co-morbidities between studied participants was hypertension, while the least common co-morbidities among patients of both groups was chronic renal diseases. These findings were supported by **Yoloğlu & Ulus (2018)** they illustrated that in their study about the effect of different positions on blood pressure that more than three-quarters of the studied patients had a history of hypertension and had more than one chronic disease. Moreover, **Abd El Hafeez & Hafez (2018)** reported that the majority of the patients in the two groups have a history related to cardiovascular disease as well as had a history of hypertension, diabetes mellitus, and smoking.

Regarding total mean scores of circulatory indices in relation to supine versus semi-fowler positions among studied patients, the present results indicated that no significant statistical differences regarding temperature, pulse, and blood pressure among the studied patients in both supine and semi-fowler groups**.** This result may be due to the position is an easy, safe, and feasible procedure that does not associated with negative impact on the hemodynamic status.

These results were in the same line with **Köse& Avşar (2021)** who summarized that the mean scores of respiratory rates mean arterial pressure and heart rate didn't change post early mobilization of patients undergoing open-heart surgery. Additionally, **Niknam et al., (2021)** they stated that there were no statistical differences of mean scores of vital signs between the two groups pre and post cardiac surgery patients when the position was changed.

Conversely, the current was contradicted with **Islam et al., (2018)** they revealed that large differences in blood pressure from one position to another in a small percentage of subjects. Additionally, **Privšek et al., (2018)**, mentioned that there was a significant difference of blood pressure values in supine and setting positions. Moreover, **Anchala (2016)** illustrated that there was a significant increase in the respiratory rate in semi fowlers.

Regarding mean scores of **respiratory indices** in relation to supine versus semi-fowler position among studied patients, the findings indicated that **there were differences statistically significant regarding respiratory rate**, **PaO_2, and SaO_2** among the studied patients in both supine and semi-fowler groups. Contrarily, no significant statistical change was noticed regarding $PaCO_2$ among the studied patients in both supine and semi-fowler groups. This improvement in PaO_2 and SaO_2 may be due to improvement of lung functions, diaphragmatic excursion, functional residual capacity, and decreased airway obstruction**.** These results were supported by **AbdEl–Aziz1 et al., (2020),** they found a significant effect of position on SaO_2, and PaO_2 was found in the group as a whole, also no

significant effects for the position on pH, $PaCO_2$, or bicarbonate were detected.

In addition to **Mezidi (2018)** reported that the impact of position on respiration and gas exchange on CABG patients, in the supine position where significantly increase PaO2/FiO2 and SaO_2. **Callan & Clark (2016)** reported significant differences regarding PaO_2 and O2 averages during different positions. But no significant difference was observed between HCO_3, PH, and PCO_2 after positioning of patient with coronary artery bypass graft surgery. **Anchala (2016)** indicated that the mean scores of oxygen saturation significantly changed in the post test among the study group in all therapeutic positions.

The results mentioned that there were statistically significant correlations between socio-demographic data especially age, past medical history, and education, circulatory and respiratory indices in relation to supine versus semi- fowler among studied patients. These results were in the same direction with **Patil &Nagarwala (2015)** noticed that the patients that are kept in supine positions effect on respiratory rate, pulse rate and blood pressure with the help of a pulse oximetery noted just before the position and also correlated with arterial blood gases report.

In contrast, **Kylie (2018)** noted that there was no significant relation between oxygen delivery and supine position. These findings suggest that supine positioning of critically ill patients post CABG who are hypoxemic or have low cardiac output does not further affect oxygenation. Moreover, this result was consistent with **Antonelli (2017)** reported that there was a positive relationship between the age of the patients and PaO2 in relation to semi setting position where it was measured first in the semi-setting position and then in the supine position, and it was found that their O2 saturation was better in the semi setting position. In addition to **Yoloğlu & Ulus (2018)** reported that the measurement of the blood pressure in the supine position had a negative correlation but found a positive correlation between systolic and diastolic blood pressure levels and other body positions as semi-setting, left lateral, and right lateral positions.

In addition to **Katz et al., (2018)** concluded that pulmonary function overall had a positive correlation with lateral positions than in a sitting position at young age without cardiopulmonary impairments. Moreover, **Anchala (2016)** reported that in his study about the effect of therapeutic positions on physiological indices that there was no significant relation between the change in blood pressure values and different positions. In addition, **Ali et al., (2021)** concluded that in their research, there was a statistically significant relationship between gender (female) and PaO2 during the sitting and supine positions.

Conclusion:

It was concluded that there was a statistically significant improvement of mean scores of respiratory indices which include respiratory rate,

PaO_2, $PaCO_2$, and SaO2 among patients in semi-fowler group compared to supine group post CABG surgery.

Recommendations:

On the light of the present study the present result recommended that semi-setting positioning should be integrated into routine care for critically ill patients' post-CABG to improve patients' physiological indices.

Limitations of this study:

Findings of research cannot be generalized because of the small sample size among patients who meet the research's inclusion requirements, which lengthens the time for data collection. Another limitation is that the present study was accompanied and restricted to one hospital. Finally, that the measurements were taken on the same day and were not repeated on different days in the same patient.

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