Hemodynamic Parameters For Mechanically Ventilated Patients

Mohamed Mohamed Ibrahim El-dosoky Omar[1]; Amal Bakr Abo El-Ata[2]; Mona Abed El-Rahman Mohamed[3]; Heba Abd El-Reheem Abd El-Reheem[4].

[1*] *PhD student, Assistant lecturer of Medical Surgical Nursing, Faculty of Nursing, Port Said University; [2]Professor of Medical Surgical Nursing, Faculty of Nursing, Port Said University; [3]Professor of Medical Surgical Nursing, Faculty of Nursing, Port Said University; [4]Assistant Professor of Medical Surgical Nursing, Faculty of Nursing, Port Said University..*

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ABSTRACT

Background: Mechanically ventilated patients (MVPs) who enter intensive care units (ICUs) suffer from immobility and prolonged bed rest, which have negative consequences on hemodynamic parameters. **Aim:** The study aimed to assess hemodynamic parameters for mechanically ventilated patients. **Subjects and Method:** The study design used was descriptive. A purposive sample of mechanically ventilated adult patients (555) was recruitedfrom the intensive care units of Egypt Health Care Authority Hospitals in Port Said City, including El-Salam, Al-Zhour, and El-Shefaa Medical Complex. **Data collection tools: Tool I:** Patients' Health Profile includes **Part 1:** Patients' data, and **Part 2**: Patients' health assessment. **Tool II:** Hemodynamic parameters assessment. **Results:** The study illustrated that the mean score of heart rate score, respiratory rate, diastolic and systolic blood pressure, mean arterial pressure, pulse pressure, central venous pressure, averages increased during assessment due to altered health, and patient tolerance to stressors as mechanically ventilated, while the mean score of arterial blood gases and percutaneous oxygen saturation remained stable among mechanically ventilated patients. **Conclusion:** The current study revealed a remarkable increase in the mean scores of most hemodynamic parameters in mechanically ventilated patients. **Recommendation:** This study suggested a passive exercise therapy program as part of the general management of mechanically ventilated patients and should be incorporated into daily clinical practice in intensive care units to improve hemodynamic parameters.

Keywords: *Hemodynamic Parameters, Mechanically Ventilated Patients.*

INTRODUTION

Intensive care unit patients are frequently sedated and immobile. In addition to increasing the hospital's length of stay (LOS), immobility can cause cognitive loss, psychological disorders, muscle weakness, and difficulty weaning off mechanical ventilation (MV) (Key, 2023). Long-term consequences include physical debility, acquired weakness, and dysfunction in neuropsychiatry which is a problem in the patient's body, thoughts, feelings, or mind and may impact the patient's and the family's quality of life (Yundari et al., 2023).

Hemodynamic parameters are general terms that reflect changes in the cardiopulmonary system as blood pressure (BP), respiratory rate (RR), central venous pressure (CVP), Heart rate (HR), and oxygen saturation (SPO2) are the most important physiologic parameters (Putu, Sukraandini, Wiasa, & Sudarmika, 2023).

The instability of hemodynamic parameters can last for several days or weeks, delaying physical activity therapies that could lead to impairment (Yundari et al., 2023). Patients in the early stages of severe illness who are in critical condition can use it until the patient is healthy enough to move on to more active interventions. Nonetheless, it seems that the patient's tolerance for exercise is what restricts the use of mobilization. Subsequently has been proposed that common bedside physiologic parameters, such as oxygen saturation, blood pressure, heart rate, respiratory rate, and pain response, can be used to know a patient's physical activity tolerance (Ghiassi, Nattanmai, Arora, 2022) .

Analyzing hemodynamic parameters has several benefits, including easing the transition off of a ventilator, reducing time spending in the ICU, improving overall health, enhancing respiratory function through improved clearance of airway secretions, and perfusion matching. It also helps prevent the negative effects of immobility, improve physical ability and consciousness levels, improve cardiovascular status, and improve psychological well-being (Elsayed, Dahroug, & Halawa, 2020).

Significance of the study

Mechanically Ventilated Patients are frequently placed on rigorous bed rest; due to intensity of illness and medications they are given (as neuromuscular blocking agents and sedatives), they may even be rendered immobile. Extended bed rest and inactivity affect numerous hemodynamic parameters and physical functioning.

Long-term immobility, decreased ciliary movement, and a compromised cough reflex are the outcomes of anesthesia with sedative medications in intubated patients. This vigilance can help minimize the risk of complications and improve circulation, which in turn can enhance various physiological measurements, including heart rate (HR), respiratory rate (RR), blood pressure (BP), oxygen saturation (SpO2), and central venous pressure (CVP) (Wang et al., 2021).

In the end, there are few researches assessing hemodynamic parameters in MVPs in Egypt. with this aspect, It's thought that study made avery important contribution to the intensive care. Ideally, this inquiry will draw interest and serve as inspiration for more investigations in the field.

AIM OF THE STUDY

The study aimed to assess hemodynamic parameters for mechanically ventilated patients.

Research Question

To fulfill the aim of this study, the following research question is formulated:

- What are the hemodynamic parameters for mechanically ventilated patients?

SUBJECTS AND METHOD

The subjects and method for the study were represented under four primary designs:

I-Technical Design

The technical design include the research designs description, setting, subjects, and tools for data qatharing.

Research Design

A descriptive research design was utilized.

Study Setting:

This research was conducted at the ICUs affiliated to Egypt Health Care Authority Hospitals in Port Said City, including El-Salam Hospital, Al-Zhour Hospital, and El-Shefaa Medical Complex. The ICU in El-Salam Hospital involves 20 beds in two rooms. It provides patients care who have major complications such as major trauma, severe burns, respiratory failure and over-sedation. The ICU in Al-Zhour Hospital involves 10 beds through two rooms and it provides services to patients who have postoperative neurological disorders. The ICU in El-Shefaa Medical Complex involves 30 beds through four rooms. It deals with patients who experience major postoperative complications as postpartum hemorrhage, cardiothoracic surgery, complex spinal surgery, and respiratory failure. The three units have all the necessary staff and cutting-edge equipment to effectively handle patients.

Study Sample

A purposive sample of mechanically ventilated adult patients, who were admited to previously mentioned setting during the period of study, were included in this study.

Inclusion Criteria

Adult mechanically ventilated patients who are both sexes who are older than 18 and conscious or semiconscious patients who are able to give oral consent were included in this study.

Exclusion criteria

Patients who experience orthopedic or vascular problems, such as extremity fracture, joint dislocation, amputation, actual deep venous thrombosis or spinal injury were excluded from study.

Sample Size

Using the Steven Thimpsone equation at research's 95% confidence power, The sample size was established using statistics (Dawsan-Saunders &Trapp, 2001).

$$n = \frac{N \times P (1-P)}{(N -1x (d2 / Z2) + P (1- P)}$$

n = Sample Size
N = Total Society Size (1850 patients/ year)
d = Error Percentage = (0.05)
P = Percentage of availability of the character and objectivity.=(0.158)
Z = The corresponding standard class of significance 95% =(1.96)

The sample selected from each hospital was calculating, to be as follow (taking **30%** from total patients)

Name of hospital	**Total number of pts./year**	**Sample selected**
Al-Zhour	500	150
Al-Salam	650	195
El-Shefaa Medical Complex (Al-Tadamon Hospital previously)	700	210
Total	**1850**	**555**

Total number of patients from statistical department in each hospital per 2022.

Tools of data gatharing

Two tools were used to gather data:

Tool I: Patients' Health Profile

It was developed by researcher in an Arabic language after reviewing relevant literatures (Gilson, 2019; Hickman et al., 2020; Rezvani, 2022; Santos et al., 2019; Wang, 2020) for assessing patients' health profile. It consists of two parts:

Part 1: Patients' Personal Profile:

It included the personal data of the patients as patient's age, sex, marital status, occupation and level of education.

Part 2: Patients' health assessment:

It included date of admission, past medical history, medical diagnosis, past surgical history, type of intubation, ventilation mode, sedation, vasopressors use and ventilation days.

Tool II: Hemodynamic parameters assessment:

This tool was developed by Stiller, Phillips, and Lambert (2004) in an English language to assess the hemodynamic parameters for mechanically ventilated patients and translate into Arabic language by the researcher . It includes patients' hemodynamic parameters as Respiratory Rate (RR), Heart Rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean Arterial Pressure (MAP), Pulse Pressure (PP), Percutaneous Oxygen Saturation (SPO2) and central venous pressure (CVP), Arterial Blood Gases (ABG) which monitored by using electronic monitoring.

II. Operational design:

The Operational design contained a preporatory phase, validity & reliability tests, fieldwork, and a pilot study.

Preporatory phase

It comprised a review on associated literature, diverse investigations, and conceptual understanding of many elements of the problems through use of books, research articles, the internet, and monthly publications.

Validit

The validity of hemodynamic parameter evaluation was stated by nine professionals in the fields of medicine and nursing who reviewed tools as relevance,

clarity, understanding, comprehensiveness, and applicability, revised tools, and no changes made based on their recommendations.

Reliability

Utilization of the Cronbach's alpha (α) coefficient to assess the internal consistency of the instrument, which obtained a value of (0.81) for hemodynamics parameters.

Pilot study

Pilot study done in 10% (56) of study patients participated in a pilot research who were chosen at random to assess feasibility, applicability, and objectivity of study instrument to estimate appropriate time required to complete the questionnaire. Based on pilot research's finding, no modifications made. Patients who took part in the pilot trial were not included in the study population.

Fieldwork

Before beginning collecting data, official approval obtained from the administrative authority. Mechanically ventilated patients met criteria included in the study. Researcher spent three days a week visiting the intensive care units of Egypt Health Care Authority Hospitals in Port Said City, which included El-Salam Hospital, Al-Zhour Hospital, and El-Shefaa Medical Complex. The researcher collected data using pre-constructed tool. An electronic monitoring system was used to monitor the hemodynamic parameters. the twenty to twenty-five-minute interview process. The researcher filled out the tool and then went over each entry in front of the patient to ensure sure nothing was overlooked.

(III) Administrative Design:

The director of Egypt Health Care Authority Hospitals in Port Said City granted official approval for data collecting upon receipt of a formal letter from the vice dean of the Faculty of Nursing at Port Said University. The researcher and mechanically ventilated patients met and discussed aim of study to enhance

cooperation during phase. Additionally, oral consent sought before beginning data collection.

Ethical Consideration:

Approved by the Faculty of Nursing, Scientific Research Ethics Committee, Port Said University with Code number NUR (4/8/2024) (40). In addition, all ethical issues were considered throughout the investigation, include describe purpose of study to director of Egypt Health Care Authority Hospitals in Port Said City to obtain permission to conduct the research. Furthermore, the researcher explains studys' purpose to each participant so that he understands the significance of his involvement. However, participants were given an overview of the study in brief and assurance that any information acquired should kept confidential and only used to the aim of study. Additionally, researcher notifies study participants that they have the opportunity to withdraw.

(IV) Statistical design

The data gathered was corrected, saved, organized, analyzed, and tabulated using the percentage and number distributions. Version 16 of the Statistical Package for Social Sciences (SPSS) program was used in statistical analysis. Proper statistical tests employed to evaluate a significant statistical difference between the study's variables.

RESULTS

Table (1) demonstrates that 55.9 % of studied mechanically ventilated patients were males. Regarding Age, 38.2 % of studied mechanically ventilated patients were in an age group more than 60 years old with Mean ±SD (49.5 ± 13.5). As regards to marital status, 45.9 % of them were married. Concerning educational level, 35.9 % of studied mechanically ventilated patients had moderate education, and 41.8 % of studied patients had manual work.

Table (2) shows that most of studied mechanically ventilated patients had DM, HTN, Renal impairments, Respiratory disorders, and, GIT disorders, 65.8 % of the studied mechanically ventilated patients had not any past surgical diagnosis. In relation to Intubation type, 74.2 % of studied mechanically ventilated patients on endotracheal tube, The mean duration of mechanical ventilation was 16 ± 3 days, 54.2 % of studied mechanically ventilated patients on SIMV mode. Regarding Vasopressors use, 50.1 % of studied mechanically ventilated patients not use any Vasopressors.

Table (3) demonstrates a remarkable increase in the mean scores of the Heart Rate (HR), Respiratory Rate (RR), Systolic (SBP), the Diastolic (DBP), Mean Arterial Pressure (MAP), Central venous pressure (CVP), Pulse Pressure (PP) among mechanically ventilated patients. While, the mean pH in Arterial Blood Gases (ABG), and the mean scores of Percutaneous Oxygen Saturation (SPO2) remained stable among mechanically ventilated patients.

Table (4a) shows that there was a statistically significant relation between studied patients' hemodynamic parameters (their heart rate, respiratory rate) and their age. Also, there is a statistically significant relation between the studied patients' hemodynamic parameters (their Systolic and diastolic blood pressure, and main arterial pressure) and their sex.

Table (4b) shows that there was a statistically significant relation between the studied patients' percutaneous oxygen saturation and their age.

Table (5a) shows that there was a statistically significant relation between the studied patients' hemodynamic parameters (their heart rate, respiratory rate) and their medical diagnosis, smoking, intubation type, ventilator mode and vasopressors use. Also, there was a statistically significant relation between the studied patients' hemodynamic parameters (their systolic and diastolic blood pressure, Main arterial pressure) and their medical diagnosis, and vasopressors use.

Table (5b) shows that there was a statistically significant relation between the studied patients percutaneous oxygen saturation and their smoking, intubation type, and ventilator mode. Regarding central venous pressure, there is a statistically

significant relation between the studied patient's central venous pressure and their ventilator mode.

Table (1): Distribution of studied mechanically ventilated patients according to personal data (n = 555)

Item	Frequency (n)	Percentage (%)
Sex		
Male	310	55.9
Female	245	44.1
Age / years		
18 < 30	33	5.9
30 < 40	77	13.9
40 < 50	89	16.0
50 < 60	144	25.9
> 60	212	38.2
Mean ±SD	49.5 ± 13.5	
Marital status		
Single	33	5.9
Married	255	45.9
Divorced	122	22.0
Widowed	145	26.1
Education Level		
Illiterate	66	11.9
Basic education	155	27.9
Moderate education	199	35.9
Higher education	135	24.3
Occupation		
Manual work	232	41.8
Office work	113	20.4
Not work	210	37.8

Table (2): Distribution of studied mechanically ventilated patients according to health assessment (n = 555)

Item	Frequency (n)	Percentage (%)
Medical diagnosis*		
DM	334	60.2
HTN	434	78.2
Renal impairments	224	40.4
Respiratory disorders	511	92.1
GIT disorders	134	24.1
Past surgical diagnosis		
Yes	190	34.2
No	365	65.8
Surgical history (n = 190)		
GIT Surgery	34	6.1
Neurosurgery	45	8.1
Orthopedic surgery	33	5.9
Endocrine surgery	34	6.1
Oncology surgery	22	4.0
Laparoscopic surgery	22	4.0
Intubation type		
Tracheostomy	143	25.8
Endotracheal Tube	412	74.2
Ventilation days	16 ± 3	
Ventilator mode		
SIMV	301	54.2
A/C	110	19.8
PSV	55	9.9
CPAP	78	14.1
Other	11	2.0
Vasopressors use		
Yes	277	49.9
No	278	50.1

***: Selection not mutually exclusive**

Table (3): Hemodynamic Parameters among mechanically ventilated patients (n = 555)

Parameter	Min – Max.	Mean ± SD.	Median
Heart Rate (HR)	60.0 – 110.0	99.54 ± 12.57	97.0
Respiratory Rate (RR)	11.0 – 22.0	21.04 ± 2.65	20.0
Systolic (SBP)	100.0 – 150.0	145.1 ± 15.88	147.0
Diastolic (DBP)	60.0 – 100.0	93.83 ± 11.78	90.0
Mean Arterial Pressure (MAP)	10.0 – 140.0	101.5 ± 9.9	100.0
Pulse Pressure (PP)	20.0 – 80.0	74.41 ± 11.3	70.0
Percutaneous Oxygen Saturation (SPO2)	91.0 – 99.0	95.79 ± 2.31	96.0
Central venous pressure (CVP)	4.0 – 19.0	19.79 ± 2.30	18.0
Arterial Blood Gases (ABG)	6.97 – 7.65	7.38 ± 0.08	7.36

Table (4a): Relation between personal data of studied mechanically ventilated patients and their hemodynamic parameters (n=555).

Personal data	Heart rate	Respiratory rate	Systolic Blood pressure	Diastolic Blood pressure	Main arterial pressure
Sex (male, female)					
T	.065	4.07	4.57	5.96	.452
p- value	.948	.873	**0.000***	**0.000***	**0.000***
Age / years					
F	17.609	6.44	5.99	7.83	0.113
p- value	**0.000***	**0.000***	.352	.241	.978
Marital status					
F	27.036	4.050	7.419	2.800	.136
p- value	.635	.635	.342	.845	.939
Education Level					
F	8.671	12.349	11.084	11.154	0.753
p- value	.635	.635	.635	.341	.521
Occupation					
F	19.60	20.60	13.41	14.84	0.365
p- value	.635	.635	.221	.412	0.694

*t =independent sample t- test, F= one- way ANOVA, * Statistically significance p≤ 0. 05*

Table (4b): Relation between personal data of studied mechanically ventilated patients and their hemodynamic parameters (n=555).

Personal data	Percutaneous Oxygen Saturation	Central venous pressure	Atrial blood gases	Pulse pressure
Sex (male, female)				
t-test	-9.224-	-1.722-	-1.256	-.439-
p- value	.312	.086	.210	.661
Age / years				
F	12.471	4.561	.316	2.671
p- value	**0.000***	.420	.867	.874
Marital status				
F	15.571	3.841	.592	.164
p- value	.210	.546	.620	.920
Education Level				
F	1.322	3.700	.603	.057
p- value	.266	.235	.603	.982
Occupation				
F	56.997	1.175	2.316	1.297
p- value	.265	.310	.100	.274

*t =independent sample t- test, F= one- way ANOVA, * Statistically significance p≤ 0. 05*

Table (5a): Relation between health assessment of studied mechanically ventilated patients and their hemodynamic parameters (n=555).

Health assessment items	Heart rate	Respiratory Rate	Systolic Blood pressure	Diastolic Blood pressure	Main arterial pressure
Medical diagnosis					
F	21.556	13.420	58.285	38.203	4.275
p- value	**0.000***	**0.000***	**0.000***	**0.000***	**.039***
Past surgical history (yes, no)					
T	1.025	6.452	2.574	2.153	.354
p- value	.306	.741	.635	.352	.724
Smoking (yes, no)					
t	4.017	3.241	1.181	2.521	.343
p- value	**0.000***	**0.001***	.238	.409	.732
Intubation type (Tracheostomy, Endotracheal tube)					
t	2.301	4.329	.138	.070	.826
p- value	**.0228***	**0.000***	.890	.369	.852
Ventilator mode					
F	1.527	15.107	13.811	7.692	.378
p- value	**0.000***	**0.000***	.951	.753	.825
Vasopressors use (yes, no)					
t	8.194	-3.169-	3.891	1.664	1.490
p- value	**0.000***	**0.002***	**0.000***	**0.000***	**0.000***

*t =independent sample t- test, F= one- way ANOVA, * Statistically significance p≤ 0. 05*

Table (5b): Relation between health assessment of studied mechanically ventilated patients and their hemodynamic parameters (n=555).

Health assessment items	Percutaneous Oxygen Saturation	Central venous pressure	Arterial blood gases	Pulse pressure
Medical diagnosis				
F	65.573	18.767	14.956	4.695
p- value	.572	.730	.785	.965
Past surgical history *(yes, no)*				
t	.693	1.180	035	1.771
p- value	.488	.239	.972	.077
Smoking (yes, no)				
t	6.985	.458	1.253	.123
p- value	**0.000***	.466	.211	.902
Intubation type (*Tracheostomy, Endotracheal tube)*				
t	6.846	6.428	.564	.689
p- value	**0.000***	.254	.573	.491
Ventilator mode				
F	13.156	16.121	.399	1.628
p- value	**0.000***	**0.000***	.809	.166
Vasopressors use *(yes, no)*				
t	4.540	1.113	.785	.143
p- value	.324	.266	.433	.886

*t =independent sample t- test, F= one- way ANOVA, * Statistically significance p≤ 0. 05*

DISCUSSION

Patients who require mechanical breathing and are in critical condition are kept in bed for long periods of time. Several organ systems may malfunction as a result of this isolation, which often worsens the initial condition. Higher tissue oxygen requirements and increased cardiac and respiratory system output are associated with routine daily interventions in critically ill patients. Immobility can result in cognitive decline, delayed hospital release, muscle weakness, and trouble weaning off of mechanical ventilation (MV) (Gupta et al., 2021, Wang et al., 2021, Yang et al., 2023).

Critically ill patients require careful monitoring every day, and hemodynamic measurements are crucial criteria for precise diagnosis and care. The primary vital physiological measures are central venous pressure (CVP), blood pressure (BP), respiratory rate (RR), heart rate (HR), and oxygen saturation (SPO2) (Vieira, et al., 2020).

This study revealed that studied patients had chronic morbid diseases affected activity levels, altered health, and patient tolerance to stressors as mechanically ventilated, these findings were consistent with Rezvani et al., (2022) who reported the highest percentage of the patients had a chronic illness as Diabetes Mellitus, Hypertension & respiratory failure and that affected activity levels, and patient's tolerance to stressors as the mechanical ventilator.

The present study demonstrated that the mean duration of mechanical ventilation was 16 ± 3 days. these findings were supported by Rezvani et al., (2022) who reported that patients in the intensive care unit are often immobile and restrained, which can induce muscle weakness, cognitive impairment, psychological difficulties, and difficulty weaning from mechanical ventilation (MV) and may increase the overall length of stay (LOS) in the hospital.

The present study demonstrated that increase Heart Rate (HR) for mechanically ventilated patients. This can be explained by the fact that The lungs and heart might require more oxygen to fulfill the requirement, which would raise the RR and HR (Claudia et al., 2022). Also, The main cardiovascular system component in charge of modifying cardiac output is HR (Rezvani et al., 2022). These findings were inconsistent with Bolin (2021) who demonstrated that according to the same perspective, historical and contemporary research have not observed any appreciable alteration in heart rate during movement of critically ill patients or following major surgery.

The present study revealed that increase Respiratory Rate (RR) for patients on mechanical ventilation. This result may be interpreted as the fact that respiratory rate was increased during mechanical ventilation (Hickmann et al., 2020). However, Several studies found that raised RR due to an increase in the rate of metabolic induced by mechanical ventilation (Trinity & Richardson, 2019, Watanabe et al.,

2023, Pinkaew et al., 2020). These results were inconsistent with Pinkaew et al., (2020) who demonstrated that despite the fact that the number of RR increases when patients' lower extremities move passively while on breathing, these changes did not vary statistically or substantially.

The present study demonstrated that increased Blood Pressure (BP) for mechanically ventilated patients. This can be explained by the fact that mechanical ventilation has psychological and physiological effects. Also, the physiological effect on mechanical ventilation is changing functions of body by increasing pulse, blood pressure and altering neurotransmitter and hormonal levels, can also affect blood flow to the bones, nutrient exchange increasing tissue oxidation, and removal of metabolic waste. These findings were supported by Indriani et al., (2023) who found a significant increase in patients' DBP and SBP toward stability.

The present study illustrated that the percutaneous oxygen saturation (SPO2) remained stable for mechanically ventilated patients. This result can be interpreted as the fact that increase HR, that turn influenced heart muscle overload occurred, cardiac output with an important increasing in SPO2 (Ghiassi et al., 2022). According to Rocha et al., (2023) who found that HR, DP, BP and SPO2 increased during study. this agreement with our findings, Ghiassi (2022) reported that ventilator significantly changes the cardiac output, HR, and SPO2. These results were inconsistent with Yang et al., (2023) who demonstrated that no significant changes in the SPO2 value during the study.

The present study demonstrated a increase on Central venous pressure (CVP) for mechanically ventilated patients, the findings were supported by Putu et al., (2023) who found a significant changes in CVP values in mechanically ventilated patients. These results agreement with Ahmed, (2019). A study by Yundari et al., (2023) revealed that the CVP mean values had changed significantly over the course of their research.

The present study found a significant increase in the patients' MAP readings towards the normal values over time. Our findings are matched with Indriani, Santoso, Arwani, & Mardiyono (2018) who noted a significant increase in patients' SBP, DBP, and MAP toward stability after the progressive mobilization. Similarly,

another study that examined the effect of passive movement on cardiovascular indices among stroke patients showed a significant increase in the DBP and MAP (Rezaeikia et al., 2019).

The present study demonstrated a slight increase in Pulse Pressure (PP) among mechanically ventilated patients. This can be demonstrated through the physical and psychological consequences of artificial breathing. Furthermore, the physiological impact of mechanical ventilation is affecting bodily functioning by raising blood pressure, pulse, and hormone levels. It can also impact food exchange, blood supply to the bones, and the elimination of metabolic waste. the findings were supported by Yundari et al., (2023) who found a significant increase in Pulse Pressure values in mechanically ventilated patients.

The present study showed that the mean pH in Arterial Blood Gases (ABG) remained stable among mechanically ventilated patients. This result can be interpreted as the fact that blood gas analysis is a popular diagnostic technique for determining the partial pressures of gases in blood as well as the acid-base content. Healthcare professionals can understand respiratory, circulatory, and metabolic issues by comprehending and applying blood gas analysis. The findings were supported by Rocha et al., (2023) showed that there was no significant statistical change in the pH and respiratory rate under mechanical ventilation.

The present study revealed that there was a statistically significant relation between the studied patients' hemodynamic parameters (their heart rate, respiratory rate,) and their age. These findings were supported by Claudia & Iosif, (2022) observed that cardiac and lung function changes with age, but the extent and the time course of changes in healthy people are largely unknown because many diseases with proposed cardiac impact are more prevalent in the older population, so hemodynamic parameters are affected by increasing age in patients.

The present study demonstrated that there was a statistically significant relation between the studied patients' hemodynamic parameters (their Systolic and diastolic blood pressure, and main arterial pressure) and their sex. These findings were supported by Hickman et al., (2020) stated that female's high risk for depression

and anxiety lead to a rise in peripheral pulse (PP), main arterial pressure (MAP) and blood pressure (BP) over time in mechanically ventilated patients.

The present study revealed that there was a statistically significant relation between the studied patients' percutaneous oxygen saturation and their age. These findings were supported by Amidei et al., (2020) reported that the influence of age on hemodynamic function is largely unknown. Because many diseases with proposed cardiac impact are more prevalent in the older population, it is pivotal to know how hemodynamic parameters are affected by age itself to discern the influence of disease from that of physiological aging.

The present study revealed that there was a statistically significant relation between the studied patients' hemodynamic parameters (their heart rate, respiratory rate) and their medical diagnosis, smoking, intubation type, ventilator mode and vasopressors use. These findings were supported by Wang et al., (2021) stated that most patients on mechanical ventilation had respiratory failure and were heavy smokers.

The present study revealed that there was a statistically significant relation between the studied patients' hemodynamic parameters (their systolic and diastolic blood pressure, Main arterial pressure) and their medical diagnosis, and vasopressors use. These findings were supported by Pinkaew et al., (2020) reported that there was a relationship between blood pressure components and organ dysfunction in critically ill patients. Blood pressure component association with ICU mortality is the strongest for mean followed by systolic, diastolic, and arterial pressure.

The present study revealed that there was a statistically significant relation between the studied patient's percutaneous oxygen saturation and their smoking, intubation type, and ventilator mode. These findings were supported by Watanabe et al. (2023) reported that intubations come with their share of complications such problems commonly include sore throat, hoarseness, scarring or paralysis of the vocal cords, and, most devastatingly, airway stenosis that affect oxygen saturation.

The present study revealed that there was a statistically significant relation between the studied patient's central venous pressure and their ventilator mode. These

findings were supported by Putu et al., (2023) Central venous pressure (CVP) is a good indicator of circulatory volume and cardiac function, which may be influenced by various factors such as function of right atrium and ventricle, venous tone, intra-thoracic pressure, and ventilator modes.

CONCLUSION

In light of the current study's findings, it can concluded that a remarkable increase in the mean scores of most hemodynamic parameters in mechanically ventilated patients due to altered health, and patient tolerance to stressors as mechanical ventilation.

RECOMMENDATIONS

The present study's conclusions lead to the following suggested a passive exercise therapy program as part of the general management of mechanically ventilated patients and should be incorporated into daily clinical practice in intensive care units to improve hemodynamic parameters.

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مؤشرات ديناميكية الدم لدي مرضي التنفس الصناعي

م.م/محمد محمد ابراهيم الدسوقي عمر [1]؛ أ.د/أمل بكر ابو العطا [2]؛ أ.د/مني عبد الرحمن محمد [3] ؛ أ.م.د/هبة هبد الرحيم عبد الرحيم[4]

[1]مدرس مساعد التمريض الباطني والجراحي بكلية التمريض جامعة بورسعيد؛ [2]أستاذ التمريض الباطني والجراحي بكلية التمريض جامعة بورسعيد ؛ [3]أستاذ التمريض الباطني والجراحي بكلية التمريض جامعة بورسعيد؛ [4] أستاذ مساعد التمريض الباطني والجراحي بكلية التمريض جامعة بورسعيد.

الخلاصة

يعاني المرضى علي التنفس الصناعي (MVPs) في وحدات العناية المركزة (ICUs) من عدم القدرة على الحركة في الفراش لفترات طويلة، الأمر الذي يمكن أن يكون ضارًا وله عواقب سلبية على مؤشرات ديناميكية الدم. الهدف: تهدف هذه الدراسة إلى تقييم مؤشرات ديناميكية الدم للمرضى على التنفس الصناعي. المواضيع والطريقة: تم استخدام تصميم البحث الوصفي. تم تجنيد عينة مقصودة من المرضى البالغين علي التنفس الصناعي (555) من وحدات العناية المركزة بمستشفيات هيئة الرعاية الصحية المصرية في مدينة بورسعيد والتي تشمل مستشفى السلام ومستشفى الزهور ومجمع الشفاء الطبي. أدوات جمع البيانات: الأداة الأولى: الملف الصحي للمرضى والذي يتضمن جزأين، الجزء الأول: البيانات الشخصية للمرضى، الجزء الثاني: التقييم الصحي للمرضى. الأداة الثانية: تقييم مؤشرات ديناميكية الدم. النتائج: أظهرت هذه الدراسة أن متوسط درجة معدل ضربات القلب، ومعدل التنفس، وضغط الدم الانقباضي والانبساطي، ومعدل التنفس، ومتوسطات معدل ضربات القلب زادت أثناء التقييم بسبب تغير الحالة الصحية، وتحمل المريض للضغوطات أثناء التهوية الميكانيكية. الاستنتاج: كشفت الدراسة الحالية عن زيادة ملحوظة في متوسط درجات مؤشرات ديناميكية الدم لدى المرضى الموضوعين على التهوية الميكانيكية. التوصية: اقترحت الدراسة برنامجًا كتمارين المدى السلبي للحركة في الإدارة الشاملة للمرضى الموضوعين على التهوية الميكانيكية ويجب دمجه في الممارسة السريرية اليومية لوحدة العناية المركزة لتعزيز مؤشرات ديناميكية الدم.

الكلمات المرشدة: مؤشرات ديناميكية الدم ، مرضي التنفس الصناعي.