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Effect of Acupressure Protocol of Care on Mechanically Ventilated Patients' Outcomes at Cairo -Egypt

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Abstract:
Background: Recent studies have emphasized the use of non-invasive complementary approaches to facilitate critically ill patients, weaning from mechanical ventilation by improving respiratory parameters. Critical care nurses play pivotal role in the implementation of acupressure protocols as part of holistic patient care in the ICU. **Aim of the study:** to evaluate the effect of acupressure protocol of care on mechanically ventilated patients' outcomes. **Research design:** a quasi- experimental research design was utilized. **Research hypothesis:** four research hypotheses were stated in the current study. **Setting:** This study was carried out at the surgical intensive care unit of the emergency hospital at one of university hospitals in Cairo. **Sample:** A purposive sample consisting of 70 adult critically ill patients receiving invasive mechanical ventilation and divided into two equal and matched groups. **Tools of data collection**: three tools were utilized to collect data penitent to the current study: critically ill mechanically ventilated patients' demographic and medical characteristics, critically ill mechanically ventilated patient's assessment sheet, and critically ill mechanically ventilated patients' outcomes. **Results:** the acupressure group showed significant improvements in tidal volume and minute ventilation ($p \leq 0.05$) immediately post-intervention, with benefits persisting at all-time points. Rapid shallow breathing index improved immediate post acupressure and at 0.5 h post-intervention ($p \leq 0.05$), while respiratory rate and oxygen saturation also showed favorable changes. Most hemodynamic parameters and complication rates remained comparable between groups (χ^2= 11.2, $p \geq 0.05$) indicating no significant differences between two groups. **Conclusion:** acupressure had positive effects on weaning indices, respiratory rate, and oxygen saturation in the mechanically ventilated patients; indicating support of the stated research hypotheses. **Recommendations:** Replication of this study on a larger probability sample in different geographic areas; and integrate acupressure protocol into nursing care for mechanically ventilated patients.

Keywords: Mechanically ventilated patients, weaning process, complementary medicine, and acupressure.

1. Introduction:

Mechanical ventilation (MV) is a supportive therapy which allows the body to reestablish homeostasis. When using this life-saving respirator intervention, critical care nurses should take proactive steps to

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reduce the risks and complications related (Peate & Hill, 2022). The process of abruptly or consistently stopping ventilator assistance could be referred to weaning of MV. Weaning must be timed carefully. Therefore, having exact parameters that can be used to assess the outcome of the weaning is essential (Elew et al., 2022).
Weaning difficulties are also greatly influenced by chronic underlying medical disorders and the outcome of acute illness in individuals with protracted MV needs. In addition to medical attention, the outcome of weaning in patients with MV is influenced by several factors, including skilled nursing, committed respiratory therapy, physiotherapy, occupational therapy, speech pathology, psychiatric care, wound care, nutritional supplementation, care coordination, complementary medicine, and family support (Dolinay et al., 2024).

Complementary therapies are defined by the National Center for Complementary and Integrative Health (NCCIH) as non-mainstream procedures performed in addition to traditional care. Complementary health modalities are believed to be applied at critical care setting that emphasize enhancing patients' psychological and physical health as well as promoting rest and relaxation. While many non-pharmacological interventions—such as music, mind-body therapies, body-based therapies, such as massage and as well as energy therapies, such as healing touch, therapeutic touch, acupuncture, acupressure, and reflexology have been thoroughly tested in critical care (Haines et al., 2021).

Acupressure is an ancient form of massage that is one of the treatment methods used in TCM. The goal of acupressure (as well as other Chinese Medicine treatments) is to encourage the movement of qi ("life energy") through the 12 channels (meridians) inside the body. These are the same energy meridians and acupoints as those targeted with acupuncture. Acupressure consists of pressing the acupuncture points to help the free flow of energy in the channel(s). Acupressure is like acupuncture, but the person uses their fingers instead of needles to work the point (Khatri, 2019).
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Also Gach, (2020) added that prolonged finger pressure applied directly to the acupressure points is a fundamental acupressure technique. It is best to apply a gradual, constant, penetrating pressure for two to three minutes. Hold the Point until the discomfort or stiffness goes away or until you sense a clear, normal pulse. Next, gradually reduce the pressure with your fingers until you're left with a gentle touch for twenty to thirty seconds. The most common error made by someone new to acupressure is pressing spots too quickly. Pain is brought on by the pressure's quick speed.
Acupressure corrects the disequilibrium between qi through channels and consequently treats the diseases. Re-equilibrium of qi attains therapeutic benefits by improving the physiological functions of body systems or Zang-fu organs. It has many mechanisms of action, especially in pain management, while definitely in case of respiratory problems; it is based on the basic principle of activation of acupoints across the meridians. The biochemical mechanism of acupressure involves the stimulation of acupoints that leads to complex neuro-hormonal responses. It involves the counteraction between hypothalamic-pituitary adrenocortical axis that leads to cortisol overproduction response. Also, it modulates a relaxation physiological response by increasing the transmission of endorphin and serotonin to the brain and to specific organs. Thus, the analgesic and sedative effect of endorphins facilitates patients' normal respiratory function and improves the effectiveness of breathing movements that translate into larger tidal volumes (Hashem, 2021).

Acupressure is being increasingly incorporated into nursing care in the intensive care units (ICUs) as a complementary method to enhance patient comfort and outcomes. ICU nurses use acupressure to help alleviate symptoms like anxiety, pain, and breathing difficulties in critically ill patients, including those receiving MV. Providing ICU nurses with training in acupressure techniques enables them to offer more holistic care that targets both physical and emotional needs, which may improve recovery and increase patient satisfaction. Training nurses in acupressure techniques empowers them to integrate these non-

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pharmacological approaches effectively, potentially improving weaning outcomes and enhancing patient comfort during mechanical ventilation (Kumar & Tan, 2023).

Significance of the study:

Approximately 71% of critically ill patients receive MV treatment. Although potentially lifesaving, MV may create a discomfort experience in patients. Previous studies have estimated that 54% of patients who received MV, experienced discomfort (Rustam, Kongsuwan, &Kitrungrote,. 2018). Invasive MV is potentially harmful due to physical (e.g., gastrointestinal complications, pain, and difficult breathing) and psychological factors (e.g., fearfulness and anxiety). Further, 27% of mechanically ventilated patients develop ventilator associated with pneumonia resulting in excess morbidity and mortality (Maa, et al., 2013).

A study done by McCullough, et.al (2014) revealed that Complementary medicine (CM) including acupressure treatment is widely used worldwide; 80% in the African Population and 42% among the Americans had used it at least once. In Egypt it was found that 77.5% of adults reported the use of CM. It has been observed over a period of 8 years of experience in intensive care units of Cairo University that mechanically ventilated patients develop some health problems and delay in the weaning process regardless of application of medical approaches. So, the integration between the medical protocols and the complementary medicine helps to improve the respiratory functions and has a positive effect on the weaning process, delayed hospital stay and the hemodynamic status of the critically ill patients.

There is a few nursing researches in accordance with acupressure treatment. A study was done by Christina et al., (2018) revealed that nurses exhibited uncertainty toward complementary and alternative medicine and demonstrated limited confidence in recommending its use. As well as, according to a systematic review and meta-synthesis by Rensburg et al., (2020), nurses' education on complementary medicines and modalities is notably limited.

Critical care nurses must have the required knowledge, skills and certifications to provide acupressure protocol of care safely and effectively. Nurses need the necessary assessment skills to carry out the ongoing assessment and evaluation of the effects of the therapy. The nursing process must be used as a basis for incorporating complementary therapy into a plan of care. Integrative nursing practice uses evidence-based practice to promote patients' ability to heal, emphasizing the use of the least interventions. It allows certified nurses to use acupressure alone or in conjunction with other approaches to treat moderate to severe symptoms.

By aligning nursing care with the principles of acupressure protocol of care and systematically evaluating its effects on patients' outcomes. Also, the findings of this study could direct the attention toward implementing acupressure protocol of care, thereby fostering a more holistic and tailored approach to the care of mechanically ventilated patients undergoing acupressure protocol of care.

Aim of the study:

The aim of this study was to evaluate the effect of acupressure protocol of care on mechanically ventilated patients' outcomes at Cairo -Egypt.

Research hypotheses:

To fulfill the aim of this study the following research hypotheses were formulated:

1. The mean post weaning indices values of mechanically ventilated patients who will be exposed to the acupressure protocol of care will differ significantly as compared to a matched control group.

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2. The mean post hemodynamic parameters values of mechanically ventilated patients who will be exposed to the acupressure protocol of care will differ significantly as compared to a matched control group.
3. Mechanically ventilated patients who will be exposed to acupressure protocol of care will have shorter duration of mechanical ventilation as compared to a matched control group.
4. Mechanically ventilated patients who will be exposed to acupressure protocol of care will exhibit fewer complications as compared to a matched control group.

Operational definitions:

- **Acupressure protocol of care:** is a structured evidenced based protocol developed by the researcher that involves exertion of a pressure at selected and specific acupoints.
- **Mechanically ventilated patients:** Critically ill patients connected to invasive mechanical ventilators within 24 hours. On weanable ventilator modes that allow the patients to take spontaneous breathes even in presences of assisted or mandatory breathes. These modes include synchronized intermittent mandatory ventilation (SIMV), Pressure support ventilation (PSV), Continuous positive airway pressure (CPAP), and biphasic positive airway pressure (BIPAP) modes of ventilation during the study.
- **Mechanically ventilated patients' outcomes**: are;

1- **The weaning indices**: Tidal Volume (VT), Minute ventilation (VE), Rapid shallow breathing index F/VT, and Mode of mechanical ventilator.

2- **Physiological parameters:** heart rate, systolic blood pressure, diastolic blood pressure, means arterial pressure and respiratory rate, and Peripheral Oxygen saturation by pulse oximetry.

The previous two outcomes assessed by critically ill mechanically ventilated patient's assessment sheet. Also, complications, length of ICU stay, weaning fate, and duration of mechanical ventilation, assessed by Critically Ill Mechanically Ventilated patients, outcomes assessment sheet.

2. Subjects and Method:

2.1: Research design:

A quasi experimental (pre & post-test) research design was utilized in the present study. Like a true experiment, a quasi-experimental design aims to establish a cause-and-effect relationship between an independent and dependent variable. However, it lacks one criterion of true experimental design (McKenna & Copnell, 2024).

2.2: Setting:

This study was conducted at the surgical intensive care unit of the emergency hospital (185 for emergencies and burns) affiliated to Cairo University Hospitals. This Intensive care unit is located at the second floor. It consists of 13 well-equipped ICU rooms. Each room contains three or four beds, and the nurse patient ratio was 1:2 or 1:3 critically ill patients. Its maximum capacity is 32 ICU beds. These rooms well equipped with all ICU medical devices e.g. hemodynamic monitor, mechanical ventilators …etc. On room is equipped with special equipment for hemodialysis sessions. Also, the unit has its own pharmacy and store for medicines.

2.3: Sample:

A purposive sample consisting of 70 adult male and female critically ill patients was selected and divided to two equal and matched groups (35 for each group).The sample size was calculated using the following equation (n=N/1+N(e)2, (n=sample size, N=total population, e=margine of errors (0.05), and Confidence level =95%)). n =1000/ (1+(1000*0.0025)) = 28. The control group who receive the routine hospital care was selected according to the inclusion criteria then the study group who receive the acupressure protocol of care in addition to the routine hospital care was matched to the control group based on matching criteria. Calculation of the study sample size: Approximately 1000 patients need mechanical ventilation

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per year in the critical care departments (ICU personal contacts). Seventy of these patients who were fulfilling the inclusion and exclusion criteria were selected. 35 patients of them were selected for control group then the other matched 35 patients were selected in the study group following the matched criteria.

Inclusion criteria: age, 21 to 69 years, gender: male or female**,** Glasgow coma scale score of 9 and above (9t or 10t), with the ability to open the eyes in response to spontaneous stimulus. Mechanically ventilated patients: within 24 hours of initiation of mechanical ventilation, and normal body mass index.

Exclusion criteria: Patients / relatives unwilling to continue cooperation**,** Presence of scars and scratches at compression points**,** Patients with amputation for each extremity, Patients on sedative and neuromuscular drugs e.g. diprivan, dormicum, precedex, Succinylcholine, Atracurium besylate, Deterioration during the study e.g. cardiac arrest, hemodynamic instability, disturbance of conscious level , attacks of agitation that required to start deep sedation infusion, and respiratory Disease e.g. chronic obstructive pulmonary disease (COPD) or respiratory failure or lung cancer patients or extensive chest trauma.

Matching criteria: the Study group and control group were matched according to age group**,** gender**,** body mass index (BMI)**,** Glasgow coma scale (GCS) scores, smoking habits**,** diagnosis and comorbidity disease.

2.4: Data collection tools:
To achieve the aim of the study, the following three tools were developed by the researcher. These tools are:

Tool (1): Critically ill mechanically ventilated patients, demographic and medical characteristics sheet: this tool covers data related to: age, gender, smoking habits, medical diagnosis, educational level, occupation, date of admission, past medical & surgical history, mid upper arm circumstances (MUAC), body mass index (BMI), medical diagnosis, GCS, Length of ICU stay, duration of MV, number of days of intervention, and serum albumin level. This data was obtained from patient's medical record by the researcher and validated from the relatives of the patient.

Tool (2): Critically Ill Mechanically Ventilated patient's assessment sheet: it consists of two domains that are described as the following:

2.1: **Weaning indices such as** tidal volume (VT) (it calculated by 6 to 8 mL per kg of body mass), Minute ventilation (VE) (It is calculated by the multiplication of the tidal volume and the respiratory rate) , Rapid shallow breathing index (RBSI)(It is calculated by dividing the respiratory frequency (in breaths/min) by the VT (in liters): and its' **Scoring system** is: (f/VT. the likelihood of successful weaning increases if the RSBI is below 105), and mode of ventilator.

2.2: Physiologic parameters such as heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), respiratory rate (RR), and Peripheral Oxygen saturation (SPO^2) by pulse oximetry.

Tool (3): Critically Ill Mechanically Ventilated patients, outcomes assessment sheet: it covers complications of respiratory, cardiovascular, central nervous, integumentary, digestive, urinary, endocrine, and musculoskeletal systems that affected any body system during the study period; Length of ICU stay; Weaning fate; and Duration of mechanical ventilation. These data were obtained pre and post acupressure treatment with different assessment points.

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2.5: Tools Validity and Reliability:

Content validity was done to identify the degree to which the used tools measure what was supposed to be measured. The developed tools were examined by a panel of three experts in critical care medicine and critical care nursing specialty to determine whether the included items were clear and suitable to achieve the aim of the current study and the reliability of the developed tools were tested. The Cronbach's Alpha values for tool 2 and tool 3 were 0.83 and 0.4 respectively demonstrating internal consistency.

2.6: Procedure:

Once official permissions were obtained the actual data collection was started. The data collection was carried out in three phases: preparatory phase, implementation phase and evaluation phases:

2.6.1: Preparatory Phase:

During this phase, the researcher conducted an extensive literature review that address complementary medicine and Chinese medicine; assessed the feasibility of the study by visiting the intensive care units and consulting experts; prepared and tested the validity of data collection tools. Then, create and revise the acupressure protocol of care, and obtain the approval from the research ethical committee, the director of the emergency hospital, and the head of ICU.As well, the researcher attended a training course over a period three months with approval certificate to apply the acupressure techniques through understanding the main concepts of Chinese medicine and acupressure for a period of three months. This phase ended up with conduction of the pilot study.

2.6.2: Implementation phase:

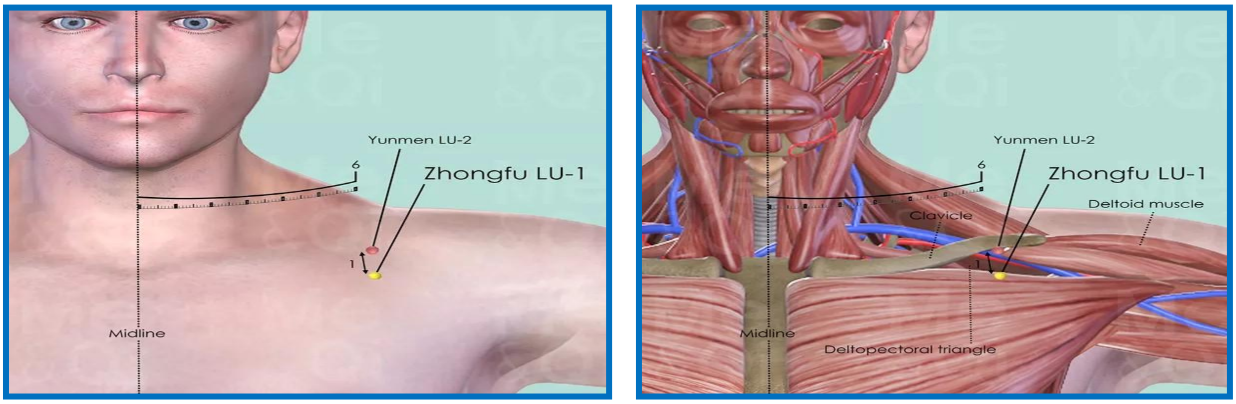
Once permissions were granted to proceed with the proposed study: the researcher began the implementation phase by creating a list of patients who are connected with mechanical ventilators and meet the inclusion criteria. Then, Patients or relatives who agreed to participate in the study were interviewed individually by the researcher to explain the nature and purpose of the study and establish rapport and cooperation. Then written consents were obtained.

The researcher started actual data collection by recruiting the control group subjects who received the routine hospital care only. After establishing rapport each control group patient was assessed utilizing tool (1) during the first contact to obtain demographic and medical characteristics. A baseline assessment of patients' physiologic parameters and weaning indices were obtained using tool (2). Then, the mechanically ventilated patients, outcomes were assessed using tool (3). These tools were used for each selected patient twice daily on two visits, the first in the morning and the second in the afternoon for four times during each visit starting 24 hours after initiation of mechanical ventilation until the patient weaned from it.

After achieving the desired number on the control group, the researcher started recruiting the study group. As regards to study group subjects, tool (1) was fulfilled during the first contact with the selected patients and those subjects exposed to routine hospital care in addition to the acupressure protocol of care. Each matched study group subject was approached individually to implement the protocol of care. This protocol of care was applied twice daily all over two visits, one in the morning and the other in the afternoon. Each patient received two acupressure sessions until weaned from mechanical ventilation. Each session was continued for three minutes for each of the six selected acupoints with a total pressure time of eighteen minutes during each of the two visits. During each session, the patient's preparation was assured. Then the patient or his/her accompanied saw simple illustrated pictures of the selected pressure points. The certified researcher utilized fingers or thumb in performing the acupressure according to the situation.

The acupressure protocol of care was applied by the following sequence: the researcher applied the pressure for 3 minutes to Zhongfu (LU1) which is located at the lateral aspect of the chest, in the 1st intercostal space, 6 cun (20 cm) lateral to the midline, below the acromial extremity of the clavicle, slightly medial to the lower border of the coracoid process (figure 1,2)

Fig. (1,2): Zhongfu LU-1 Acupuncture Point. (2023). Meandqi.com. https://www.meandqi.com/tcm-



education-center/acupuncture/lung-channel/zhongfu-lu-

Then the researcher applied the pressure for 3 minutes over Yuji (LU10) which is located at the radial aspect of the midpoint of the first metacarpal bone, on the junction of the red and white skin (the junction of the dorsum and palm of the hand). (figure 3,4)

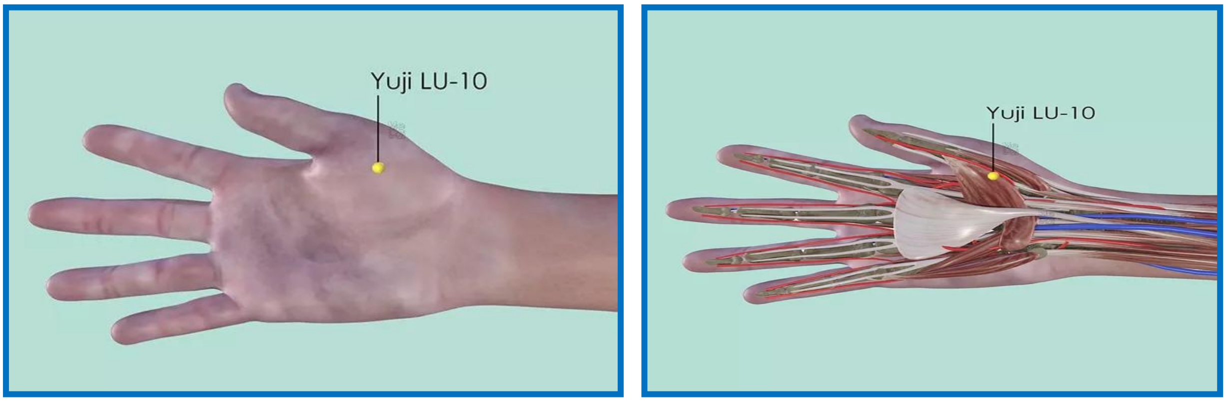


Fig (3,4): Yuji LU-10 Acupuncture Point. (2023). Meandqi.com. https://www.meandqi.com/tcm-education-center/acupuncture/lung-channel/yuji-lu-10

Then the researcher applied the pressure for 3 minutes to Hegu (LI4) which is located in between the 1st and 2nd metacarpal bones, approximately in the middle of the 2nd metacarpal bone on the radial side (figure 5,6).

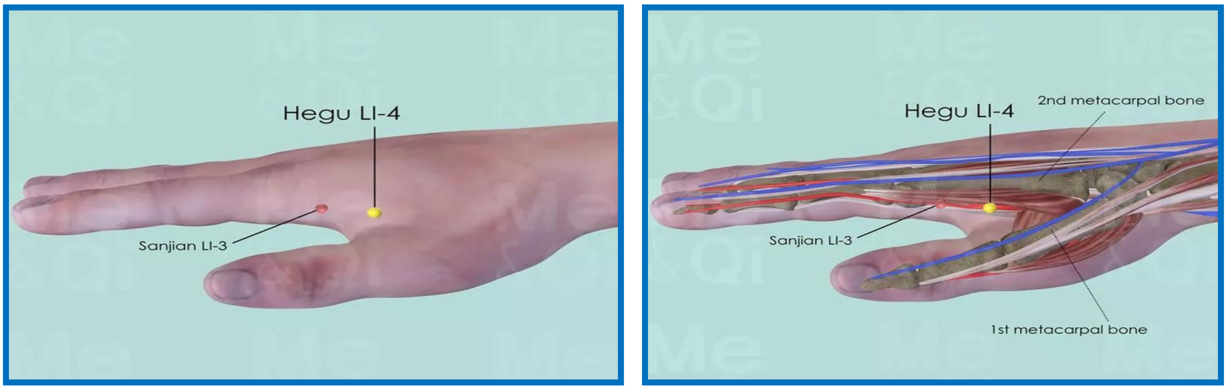


Fig (5,6): Hegu LI-4

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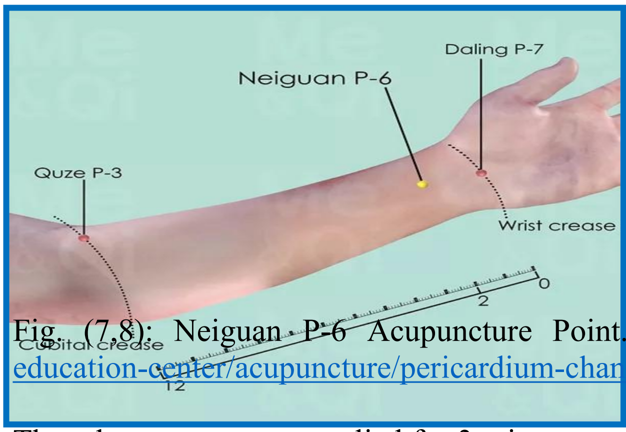
Acupuncture Point. (2023). Www.meandqi.com. https://www.meandqi.com/tcm-education center/acupuncture/large-intestine-channel/hegu-li-4

After this acupoints, the researcher applied the pressure for 3 minutes to Neiguan (PC6) which is located at the anterior forearm about 5 cm (2 cun of units in traditional Chinese medicine (TCM) proximal to the transverse wrist crease, between the tendons of the palmaris longus and flexor carpiradialis muscles (figure 7,8)



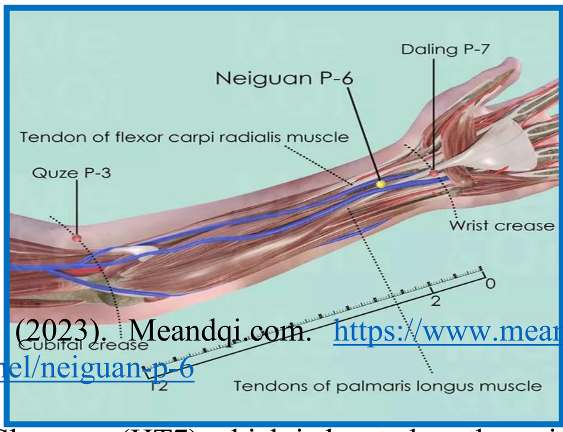
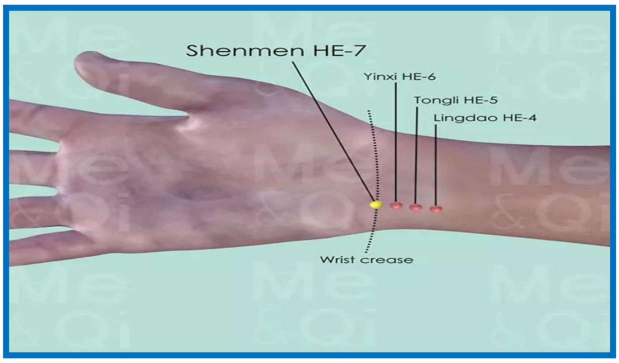
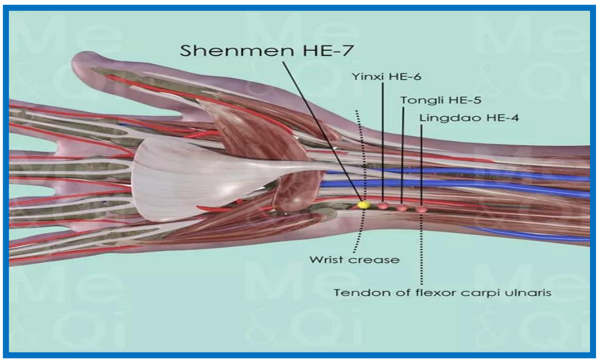


Fig. (7,8): Neiguan P-6 Acupuncture Point. (2023). Meandqi.com. https://www.meandqi.com/tcm-education-center/acupuncture/pericardium-channel/neiguan-p-6

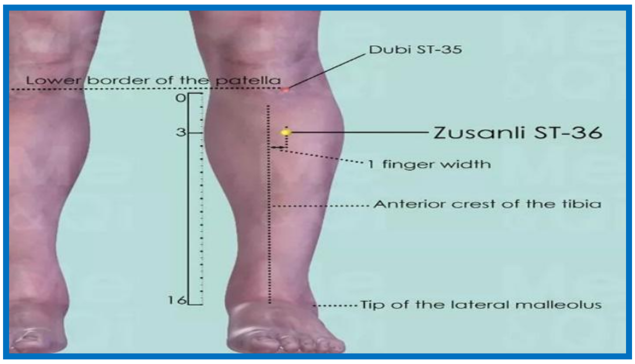
Then the pressure was applied for 3 minutes to Shenmen (HT7) which is located on the wrist, at the ulnar end of the transverse crease of the writs, in the depression on the radial side of the tendon m. flexor carpi ulnaris (figure 9,10)

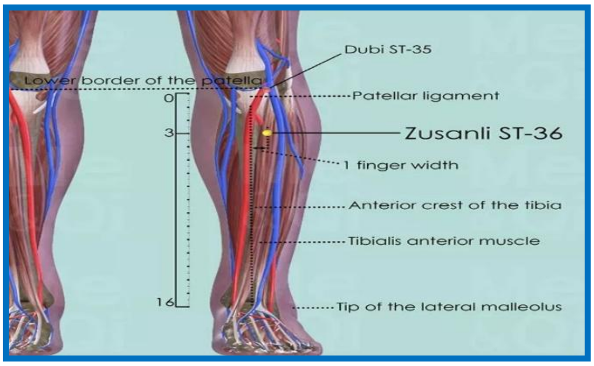




Fig(9,10):Shenmen HE-7 Acupuncture Point. (2023). Meandqi.com. https://www.meandqi.com/tcm-education-center/acupuncture/heart-channel/shenmen-he-7

Finally, the researcher applied the pressure for 3 minutes to Zusanli ST-36 which is located at four finger widths down from the bottom of the kneecap, along the outer boundary of your shin bone(figure 11,12):
Fig (11,12): Zusanli ST-36 Acupuncture Point. (2023). Www.meandqi.com.





https://www.meandqi.com/tcm-education-center/acupuncture/stomach-channel/zusanli-st-36

The middle finger was moved in small circles, or in a back-and-forth motion, but remained located over the same point on the skin. Acupressure was applied for 1.5 minutes at each point bilaterally. Acupressure was performed at the same time, either morning or afternoon for each participant with continuous monitoring and close observation by the researcher. The acupoints location, the skin thickness, and the adipose tissue were considered during the pressure application.

2.6.3: Evaluation Phase:

The researcher collected and documented the weaning indices, hemodynamic parameters using tool (2), and the mechanically ventilated patients' outcomes using tool (3) at 4 intervals before intervention, immediately post intervention, then 30 minutes and one hour after the start of each session using tools two and three for each visit for patients' disconnection from mechanical ventilation.

2.7: Ethical Consideration

Final approval was obtained from the ethics committee at the Faculty of Nursing - Cairo University with IRB: 201941701. As well, final approval was obtained after finishing data collection. Also, official permissions were obtained from hospital administrators to conduct the study. Participation in the study was entirely voluntary; each subject had the right to withdraw from the study when decided. Informed consent was obtained from the subjects or their relatives. Anonymity and confidentiality were assured through coding of the data of the subjects / their relatives were assured that this data will be used in the purpose for the research only.

3. Results and Data Analysis:

3.1: Finding related demographic characteristic data and medical data:

Table (1) reveals that, approximately one quarter of the total study sample was in the age group between 40-49 years, 50-59 years, and 60-69 years in a percentage of 24.5%, 27 %, and 27% respectively with a mean age of 49.8±12.9 years. More than half of total study sample was males, non-smoker, and had a free past medical history. The mean length of ICU stay was 8.5 ±4.8 days among the study group, and 10 ± 4.8 day among the control group. The mean days of intervention was 2.4 ±0.7 day among the study group, and 2.8 ± 0.8 day among the control group. The mean MUAC of the study group was 26 ±1.1, and 26 ±1.2 for the control group. No significant statistical differences were found between the two groups regarding demographic and medical characteristic data.

Table (1): Comparison between the Study and Control Groups in Relation to Demographic and Medical Characteristic Data (N=70).

Variables	Study Group (n=35)		Control Group(n=35)		Total (N=70)		χ2/ T test	p Value
	N	%	N	%	N	%		
Age group:								
20-29 yrs.	3	8.5 %	3	8.5 %	6	8.5 %	0.27	0.9 NS
30-39 Yrs.	5	14%	4	11%	9	13%		
40-49 Yrs.	8	23%	9	26%	17	24.5%		
50-59 Yrs.	10	28.5%	9	26%	19	27%		
60-69 Yrs.	9	26%	10	28.5%	19	27%		
Total	35	100%	35	100%	70	100%		
Mean of age	49.9 ± 12.8		49.7 ± 13		49.8 ± 12.9		-0.04	0.7 NS
Gender:								

Male	24	69%	24	69%	48	(69%)	0.000	1.0 NS
Female	11	31%	11	31%	22	(31%)		
Total	35	100%	35	100%	70	100%		
Smoking habit:								
Non- Smoker	25	71%	25	29%	50	71%	0.000	1.0 NS
Smoker	10	29%	10	71%	20	29%		
Total	35	100%	35	100%	70	100%		
Number of cigarettes /days:								
10	0	0%	1	10%	1	5%	5.2	0.5 NS
15	0	0%	1	10%	1	5%		
20	5	50%	5	50%	10	50%		
25	2	20%	0	0%	2	10%		
30	3	30%	2	20%	5	25%		
40	0	0%	1	10%	1	5%		
Total	10	100%	10	100%	20	100%		
Past medical history								
Non	22	63%	22	63%	44	63%	0.000	1.0 NS
DM	4	11%	4	11%	8	11%		
HTN	3	9%	3	9%	6	9%		
IHD	1	3%	1	3%	2	3%		
DM, HTN, & IHD	1	3%	1	3%	2	3%		
DM & HTN	3	9%	3	9%	6	9%		
DM & IHD	1	3%	1	3%	2	3%		
Total	35	100%	35	100%	70	100%		
Length of ICU stay:	8.5 ±4.8		10 ± 4.8		10 ± 4.8		1.6	0.6NS
Days of Intervention	2.4 ±0.7		2.8 ±0.8		3 ±1		2.4	0.5NS
MUAC	26 ±1.1		26 ±1.2		26.043 ±1.2		0.1	0.9NS
NS: NS: No significant statistical difference, DM: Diabetes Mellitus, HTN: Hypertension, IHD: Ischemic Heart Disease, ICU: intensive care unit, MUAC: mid upper arm circumference.								

3.2: Finding related to testing the research hypotheses:

H1. States that: the mean post weaning indices values of mechanically ventilated patients who will be exposed to the acupressure protocol of care will differ significantly as compared to a matched control group (From table 2 to 5).

Table (2) shows increment in the mean VT of the study group in different assessment times (562.4 ± 122.6, 542.4 ± 101, and 495.1 ± 96respectively) as compared to the baseline (454 ± 65.9) with high significant statistical differences ($F=20.1$, $P \leq 0.05$). Similarly, the table demonstrated increment in the mean VE in different assessment times (13420 ±2370, 12188± 2021, and 10274 ± 2051respectively) as compared to the baseline (8935±1536) with high significant statistical differences ($F=77.2$, $P \leq 0.05$). RSBI showed decrement in the mean RBSI in different assessment times (40.7 ± 8.5, 40.6 ± 8.3, and 44.3±10.3respectively) as compared to the baseline (44.5 ± 11.7) with high significant statistical differences ($F=6.2$, $P \leq 0.05$). The same pattern was observed in the second assessment time of first day and in two assessment times of second day.

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Table (2): Comparison of Means Weaning Indices of Study Group in the First and Second Day at Different Assessment Times (N=35).

Table (3) illustrates increment in the mean VT of the control group in different assessment times (487.6 ± 65, 468.7 ± 77, and 451.8 ± 67 respectively) as compared to the baseline (446.7 ± 65) with high significant statistical differences (F=20.5, $p \leq 0.05$) in the first assessment time of first day. Similarly, it demonstrates increment in the mean VE in different assessment times (10145 ±2261, 9797 ± 1678, and 9161 ± 1263 respectively) as compared to the baseline (8866.3±1724) with high significant statistical differences (F=16.8, $p \leq 0.05$) in the first assessment time of first day. In contrast, showed that change in the mean RBSI in different assessment times (44.5 ± 8, 45.7 ± 9, and 46 ± 10respectively) as compared to the baseline (44.9 ± 8) with no significant statistical differences (F=0.4, $p \geq 0.05$). The same pattern was observed in the second assessment time of first day and in two assessment times of second day.

Table (3): Comparison of Means Weaning Indices of the Control Group in the First and Second Day at Different Assessment Times (N=35)

Day	Weaning indices	Assessment	Pre-intervention	Immediate post intervention	30 minutes post intervention	One hour post intervention	F	P
			Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD		
First day	VT	1st	446.7 ± 65	487.6 ± 65	468.7 ± 77	451.8 ± 67	20.5	0.000 ***
		2nd	448 ±51	496±62	474.9 ±71	457.7±75	14.6	0.000 ***
	VE	1st	8866.3±1724	10145 ±2261	9797 ± 1678	9161 ± 1263	16.8	0.000 ***
		2nd	8917±1201	10739±1628	10033±1376	9333±1424	48	0.000 ***
	RSBI	1st	44.9 ± 8	44.5 ± 8	45.7 ± 9	46 ± 10	0.4	0.7 NS
		2nd	44.5 ± 7	44 ± 8.5	45.6 ± 10	45.8 ± 10.6	0.7	0.5 NS
Second day	VT	1st	443 ± 67	479 ± 62.5	471 ± 65	462 ± 66	13.6	0.000***
		2nd	449.7 ± 63	476.8 ± 59	462.8 ± 63	455.8 ± 57	17.2	0.000***
	VE	1st	8963 ± 1332	10315 ± 1533	9846 ± 1333	9506 ± 1255	16.3	0.000***
		2nd	8950 ± 1217	10103 ± 1258	9695 ± 1192	9285 ± 1436	21	0.000***
	RBSI	1st	45.9 ± 11	44.6 ± 10	45.2 ± 11.6	45 ± 8.6	0.26	0.85 NS
		2nd	45 ± 6.9	45 ± 8.6	46 ± 9.6	45 ± 7.3	0.6	0.6 NS

NS: No significant statistical difference, SD: standard deviation, *: significant statistical difference, VT: Tidal Volume, VE: Minute Ventilation, RBSI: Rapid Shallow Breathing Index

Day	Weaning indices	Assessment	Pre-intervention	Immediate post intervention	30 minutes post intervention	One hour post intervention	F	P
			Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD		
First day	VT	1st	454 ± 65.9	562.4 ± 122.6	542.4 ± 101	495.1 ± 96	20.1	0.000***
		2nd	467.6 ± 78.9	589.6 ±99.8	549.6 ±83.3	500.9 ±93.8	40.7	0.000***
	VE	1st	8935 ± 1536	13420 ±2370	12188± 2021	10274 ± 2051	77.2	0.000***
		2nd	9288.7 ±1476.6	13599±2600	12024±2161	10493±1761	65.2	0.000***
	RSBI	1st	44.5 ± 11.7	40.7 ± 8.5	40.6 ± 8.3	44.3±10.3	6.2	0.002**
		2nd	43 ± 9.8	40±8.4	40±7.8	43±9.1	4.6	0.008**
Second day	VT	1st	457.6 ± 75	584 ± 78	541 ± 142	502 ± 82	81	0.000***
		2nd	465 ± 77	593 ± 78	547 ± 94	492 ± 98	64.5	0.000***
	VE	1st	9088±1239	13694±1886	12158±2026	10648±1770	125	0.000***
		2nd	9319±1196	13683±2299	11857±2290	10361±1826	71.3	0.000***
	RBSI	1st	45 ± 10	41 ± 8.8	41 ± 8.4	42 ± 7.7	3.3	0.03*
		2nd	44 ± 11	39 ± 6.4	40.3 ± 7.6	43.6 ± 10.8	5.6	0.003**

NS: No significant statistical difference, SD: standard deviation, *: significant statistical difference, VT: Tidal Volume, VE: Minute Ventilation, RBSI: Rapid Shallow Breathing Index

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Table (4) indicates no statistically significant differences between the study and control groups at baseline assessment for all weaning indices. At the first assessment time, there were significant statistical differences between the study and control groups regarding VT immediately, 0.5 hour, and one hour post intervention (t= 3.1, $p \leq 0.05$, t=3.4, $p \leq 0.05$, and t=2.1, $p \leq 0.05$) respectively. In relation to VE at the first assessment time there were significant statistical differences between the study and control groups immediately, 0.5 hour, and one hour post intervention with (t= -5.9, $p \leq 0.05$, t=-5.3, $p \leq 0.05$, and t=2.7, $p \leq 0.05$) respectively. The same pattern was detected at the second assessment time for VT and VE. Regarding RSBI, there was a significant statistical difference between the study and control groups 30 minutes post intervention (t=-2.3, $p \leq 0.05$) at the first assessment time, then at second assessment time there were significant statistical differences immediately and 30 minutes post intervention (t=-2.15, $p \leq$ 0.05and t= -2.5, $p \leq 0.05$) respectively.

Table (4): Comparison Between Means Weaning Indices of the Study and Control Group at The First Day at Different Assessment Times (N=70).

Weaning indices	Assessment		Pre-intervention		Immediate post intervention		30 minutes post intervention		One hour post intervention	
			Study group	Control group	Study group	Control group	Study group	Control group	Study group	Control group
			n=35	n=35	n=35	n=35	n=35	n=35	n=35	n=35
Tidal Volume (VT)	1st	Mean ± SD	454.3 ± 65.9	446.7 ± 65.2	562.4 ± 122	487.6 ± 65	542 ± 101	468 ± 77	495 ± 96	451 ± 67
		t test	0.4		3.1		3.4		2.1	
		p value	0.6 NS		0.002**		0.001 **		0.033*	
	2nd	Mean ± SD	467.6 ± 79	448.4± 51.4	589.6 ± 99	496 ± 62	459 ± 93	474 ± 71	500 ± 93	457 ± 75
		t test	1.2		4.6		4.0		2.1	
		p value	0.2 NS		0.000 ***		0.000 ***		0.037*	
Minute ventilation (VE)	1st	Mean ± SD	8935.5 ± 1536	8866.3 ± 1724	13420.6 ± 2370	10145.9 ± 2261	12188 ± 2021	9797 ± 168	10274 ± 2051	9161 ± 1263
		t test	0.17		-5.9		-5.3		2.7	
		p value	0.8 NS		0.000 ***		0.000 ***		0.008**	
	2nd	Mean ± SD	9288.7 ± 1477	8917.6 ± 1201	13599 ± 2600	10739 ± 1628	12024 ± 2161	10033 ± 1376	10493 ± 1761	9333 ± 1424
		t test	1.15		-5.5		-4.5		3	
		p value	0.2NS		0.000 ***		0.000 ***		0.003**	
Rabid shallow breathing index (RSBI)	1st	Mean ± SD	44.5 ± 12	44 ±8	40.7 ±8.5	44.5 ±8.6	40 ±8	45 ±9.9	44 ±10	46 ±9
		t test	0.16		- 1.8		-2.3		-0.7	
		p value	0.8 NS		0.067 NS		0.023*		0.4 NS	
	2nd	Mean ± SD	43.1 ±9.8	44.5 ±7.2	40 ±8	44 ± 8	40 ±7	45 ±10	43 ±9	45 ±10
		t test	0.6		-2.15		-2.5		-1.1	

		p value	0.5 NS	0.03 *	0.014*	0.25 NS
NS: No significant statistical difference, SD: standard deviation, *: significant statistical difference						

Table (5) illustrates no statistically significant differences between the study and control groups at baseline assessment for all weaning indices. Regarding VT at the first assessment time, significant statistical differences were observed between the study and control groups immediately, 30 minutes, and one hour post intervention (t=6.1, $p \leq 0.05$, t=2.6, $p \leq 0.05$, and t=2.2, $p \leq 0.05$) respectively. As well, VE at the first assessment time significant statistical differences were found immediately, 30 minutes, and one hour post intervention (t=5.6, $p \leq 0.05$, t=5.6, $p \leq 0.05$, and t=3.1, $p \leq 0.05$) respectively. The same pattern was detected at the second assessment time for VT and VE. Regarding RSBI, no significant statistical difference was found between groups at the first assessment time. In contrast, at the second assessment time, significant statistical differences were noted immediately, and 30 minutes post intervention (t=-3.3, $p \leq 0.05$and t=-2.9, $p \leq 0.05$) respectively.

Table (5): Comparison of Means Weaning Indices of the Study and Control Groups at the Second Day at Different Assessment Times (N=70).

Weaning indices	Assessment		Pre-intervention		Immediate post intervention		30 minutes post intervention		One hour post intervention	
			Study group	Control group	Study group	Control group	Study group	Control group	Study group	Control group
			n=35	n=35	n=35	n=35	n=35	n=35	n=35	n=35
Tidal Volume (VT)	1st	Mean ± SD	457.6 ± 75	443.1 ± 67	584 ±78	479 ±62	541 ± 142	471 ± 65	502 ± 82	462 ± 66
		t test	0.8		6.1		2.6		2.2	
		p value	0.4 NS		0.000 ***		0.01*		0.031*	
	2nd	Mean ± SD	465 ±78	449.7 ± 63	593 ±79	476 ± 59	547 ± 94	462 ± 63	492 ± 98	455 ± 57
		t test	0.8		6.8		4.3		1.8	
		p value	0.6 NS		0.000***		0.000***		0.06 NS	
Minute ventilation (VE)	1st	Mean ± SD	9088.3± 1239.9	8963.4± 1332.3	13694 ± 1886	10315 ± 1533	12158± 2026	9846± 1333	10648± 1770	9506± 1255
		t test	0.4		5.6		5.6		3.1	
		p value	0.7 NS		0.000***		0.000***		0.03*	
	2nd	Mean ± SD	9307.4 ±1212.8	8950.4 ±1217	13683 ± 2299	10103 ± 1258	11857 ± 2290	9695 ± 1192	10361 ± 1826	9285 ± 1436
		t test	1.2		1.8		4.9		2.7	
		p value	0.2 NS		0.00 **		0.00**		0.008**	
Rabid shallow breathing index (RSBI)	1st	Mean ± SD	45.0 ±10.4	45.9 ±11.1	41 ± 8.8	44.6 ± 10.9	41 ±8.4	45 ±7.6	41 ±8	45 ±11
		t test	-0.3		- 1.4		-1.5		-1.5	
		p value	0.7 NS		0.16 NS		0.127 NS		0.12NS	
	2nd	Mean ± SD	44.2 ±11.5	45 ±6.9	39.0 ± 6.4	45.2 ± 8.6	40 ±7.6	46 ±9.3	43 ±10.8	45 ±7.3
		t test	-0.4		- 3.3		-2.9		-0.75	
		p value	0.2 NS		0.001 **		0.005 **		0.45 NS	
NS: No significant statistical difference, SD: standard deviation, *: significant statistical difference										

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Day	Hemodynamic parameters	Assessment	Pre-intervention	Immediate post intervention	30 minutes post intervention	One hour post intervention	F	P
			Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD		
First day	HR (bt/ min)	1st	98.4 ± 16.8	99 ± 16.8	96 ± 22	95.7 ± 22.5	0.83	0.48NS
		2nd	98.8 ± 16.9	99.6 ± 16.7	99.6 ± 16.4	97.4 ± 22	1.3	0.28NS
	SBP (mmHg)	1st	116 ±18	116.9 ± 18	115.5 ± 17	115 ± 16.8	2.8	0.05NS
		2nd	115 ± 16.8	115.9± 16.6	115.5 ± 16.8	116 ± 16.7	1.2	0.3NS
	DBP (mmHg)	1st	67.9 ± 10	68 ± 8.8	68 ± 6.4	67.6 ±9	0.18	0.9NS
		2nd	68.4 ± 8	68 ± 9.6	68 ± 9.2	68 ± 10	0.15	0.9NS
	MAP (mmHg)	1st	84 ± 11	84 ± 11	81 ± 18	83 ± 10	2.2	0.1NS
		2nd	83 ± 10.8	84 ± 11	83.9 ± 10.7	84.5 ±11.5	0.8	0.5NS
	RR (br/min)	1st	19.8 ±2.8	23 ± 2.8	22 ± 2.4	21 ± 2	52.6	0.000***
		2nd	19.8 ± 2.5	23 ±2.9	21.7 ± 2.9	20.9 ± 2.2	54	0.000***
	Spo2 %	1st	98 ± 1	98 ± 0.9	98 ± 1.1	98 ± 0.8	0.9	0.4NS
		2nd	98.5 ± 1	98 ± 1	98 ± 0.9	98 ± 0.8	0.7	0.5NS
Second day	HR (bt/ min)	1st	97 ± 16	97.6 ± 16	97 ± 15	97±16	1.1	0.3NS
		2nd	97 ± 16	97.6 ± 15.9	96.9 ± 16	97 ± 15.7	1.8	0.2NS
	SBP (mmHg)	1st	116.5 ± 17	116 ± 16	116 ± 16.7	115 ± 16	0.9	0.5NS
		2nd	115 ± 16.8	116 ± 16	116 ± 16	114 ± 15.9	3.9	0.01*
	DBP (mmHg)	1st	68 ± 8.3	68 ± 8.7	68.3 ± 8.4	67.8 ± 8.4	0.4	0.7 NS
		2nd	68.9 ± 8.9	68.6 ± 8.8	68.8 ± 8.6	68 ± 9	1.5	0.2NS
	MAP (mmHg)	1st	84 ± 10.5	83.8 ± 10	83.9 ±10.5	83 ± 10	1.4	0.3NS
		2nd	84 ± 10	84 ± 10	84 ± 10	83 ± 10	2.2	0.1NS
	RR (br/min)	1st	20 ± 2	23 ± 2	22 ± 2	21 ± 1.9	15	0.000***
		2nd	20 ± 2.7	23 ± 2.6	21.6± 2.1	20.9 ± 2	13	0.000***
	Spo2 (%)	1st	98 ± 0.9	98 ± 1	98 ± 1	98 ± 0.9	0.4	0.7NS
		2nd	97.8 ± 1.6	98 ± 0.8	98 ± 0.9	98 ± 0.7	0.5	0.6NS

HR: heart rate; SBP: systolic blood pressure; DBP; diastolic blood pressure; MAP: mean arterial blood pressure, RR: respiratory rate, SpO2: peripheral oxygen saturation, NS: No significant statistical difference, *: significant statistical difference SD: standard deviation

Concerning the second research hypothesis that states the mean post hemodynamic parameters values of mechanically ventilated patients who will be exposed to the acupressure protocol of care will differ significantly as compared to a matched control group (From table 6 to 9).

Table (6) demonstrates that HR, DBP, MAP and Spo2, didn't show significant differences after intervention as compared to pre intervention at both assessment times of the first and second days. As well, it revealed increment in the mean RR in different assessment times (23 ± 2.8, 22 ± 2.4, and 21 ± 2) respectively as compared to the baseline (19.8 ±2.8) with high significant statistical difference (f=52.6, $p \leq 0.05$) in the first assessment time of the first day. The same trend was detected at the second assessment time of the first day. On the second day, the same pattern was detected except the mean SBP was changed in different assessment times (116 ± 16, 116 ± 16, and 114 ± 15.9) respectively as compared to the baseline (115 ± 16.8) with significant statistical difference (f=3.9, $p \leq 0.05$) in the second assessment time.

Table (6): Comparison of Means Hemodynamic Parameters of the Study Group at the First and Second Day at Different Assessment Times (n=35).

Table (7) demonstrates that HR, SBP, and MAP didn't show statistically significant differences after intervention as compared to pre-intervention at both assessment times of the first and second day. As well, it reveals increment in the mean RR in different assessment times (21 ± 2, 20.9 ± 1, and 20 ± 1.6)

Day	Hemodynamic parameters	Assessment	Pre-intervention	Immediate post intervention	0.5h post intervention	One hour post intervention	F	p
			Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD		
First day	HR (bt/ min)	1st	104 ± 20	105 ± 20	104.7 ± 21	105 ± 20	2.2	0.1
		2nd	103.6 ± 19.8	101.6 ± 26	104 ± 19.7	104 ± 19	0.96	0.4
	SBP (mmHg)	1st	116.7 ± 20.9	117 ± 21	117.6 ± 21.7	117 ± 21.9	0.4	0.7
		2nd	117 ± 20.6	117.5 ± 19.9	117 ± 20.5	117.8 ± 20	0.4	0.7
	DBP (mmHg)	1st	68 ± 9.9	69 ± 9	68.7 ± 10.7	69 ± 9.8	0.8	0.5
		2nd	70 ± 9.9	70.5 ± 10	69 ± 10	69 ± 10	1.6	0.2
	MAP (mmHg)	1st	84 ± 12.7	85 ± 12	84.9 ± 13	82 ± 16	0.8	0.5
		2nd	85.8 ± 12	85.8 ± 12	85 ± 12.6	85 ± 12	1	0.39
	RR (br/min)	1st	19 ± 3.8	21 ± 2	20.9 ± 1	20 ± 1.6	5.7	0.003**
		2nd	19.8 ± 1.8	21.7 ± 2	21 ± 1.6	20 ± 1.8	19	0.000***
	Spo2 (%)	1st	98 ± 1.5	98 ± 1	98 ±1	98 ± 1.5	0.18	0.9
		2nd	98 ± 1.6	98 ± 1	97.8 ±1	98 ± 1	1.8	0.2
Second day	HR (bt/ min)	1st	99.8 ± 24	99.6 ± 23	102.6 ± 19	102 ± 18.8	0.7	0.5
		2nd	97 ± 28	99 ± 23	102.7 ± 19.9	102 ± 20	0.86	0.4
	SBP (mmHg)	1st	117.6 ± 19	115.5 ± 26.7	117.8 ± 18	117 ± 19	0.4	0.7
		2nd	118 ± 20	18.7 ± 19	117.6 ± 19	117.9 ± 18.7	0.6	0.6
	DBP (mmHg)	1st	71.8 ± 9.6	70 ± 10	71.7 ± 9	70.9 ± 9	2.7	0.058*
		2nd	71.5 ± 9.5	71 ± 10.6	70.6 ± 10.5	70 ± 9	2	0.1
	MAP (mmHg)	1st	86.5 ± 13	86 ± 12	86.6 ± 11	86 ± 11.6	0.7	0.5
		2nd	86.5 ± 12	86.9 ± 12	86 ± 12	85.9 ± 11	0.9	0.5
	RR (br/min)	1st	20 ± 1.5	21.6 ± 1.7	20.9 ± 1.5	20.7 ± 1	8.3	0.000***
		2nd	20 ± 1	21 ± 2	21 ± 1.5	20 ± 1.7	8.6	0.000***
	Spo2 (%)	1st	97.7 ±1.6	98 ± 1	97.7 ± 1.7	98 ± 1.5	2.9	0.047*
		2nd	98 ± 1	97.9 ± 1.5	97.8 ± 1	98 ± 1	0.67	0.6

respectively as compared to the baseline (19 ± 3.8) with high significant statistical difference ($F=5.7$, $P \leq 0.05$) in the first assessment time of the first day. The same trend was detected at the second assessment time of the first day. At the second day, the same pattern was detected except the mean DBP was changed at different assessment times (70 ± 10, 71.7 ± 9, and 70.9 ± 9) respectively as compared to the baseline (71.8 ± 9.6) with significance statistical difference($F= 2.7$, $P \leq 0.05$).As well, the mean SPO2 was change in different assessment times (98 ± 1, 97.7 ± 1.7, and 98 ± 1.5) respectively as compared to the baseline (97.7 ±1.6) with significance statistical difference ($F= 2.9$, $P \leq 0.05$) at the first assessment time.

Table (7): Comparison of Means Hemodynamic Parameters of the Control Group in the First and Second Day at Different Assessment Times (n=35):

Table (8) presents that HR, SBP, DBP, and MAP didn't show significant statistical differences regarding the baseline values at the two assessment times between the control and the study group. In contrast, RR demonstrated significant statistical differences were observed at the first assessment time between the study and control groups immediately, and at 30 minutes post intervention ($t=0.2$, $p \leq 0.05$ and $t=2.2$, $p \leq 0.05$) respectively. As well at the second assessment time, RR demonstrated significant statistical difference immediately post intervention only ($t=0.2$, $p \leq 0.05$). SPO^2 demonstrated significant statistical difference one hour post intervention ($t=2.2$, $p \leq 0.05$) in the second assessment time.

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Table (8): Comparison of the Study and Control Groups as Regards to Means Hemodynamic Parameters at the First Day at Different Assessment Times (N=70):

Hemodynamic parameters	Assessment		Pre-intervention		Immediate post intervention		0.5h post intervention		One hour post intervention	
			Study Group	Control group	Study group	Control group	Study group	Control group	Study group	Control group
			n=35	n=35	n=35	n=35	n=35	n=35	n=35	n=35
HR (bt/min)	1st	Mean ±SD	98.4±16.8	104.3±20.9	99±16	105±20	96±22	104±21	95±22	105±20
		t test	1.2		-1.4		-1.6		-1.8	
		p value	0.2 NS		0.15		0.1 NS		0.07 NS	
	2nd	Mean ± SD	98.8±16.9	103.6±19.8	99.6±16	101.6±26	99±16	104±19	97±22	104±19
		t test	1		-0.3		-1.0		-1.3	
		p value	0.28 NS		0.6 NS		0.2NS		0.18 NS	
SBP (mmHg)	1st	Mean ± SD	116±18	116±20	116.9±18	117±21	115±17	117±21	115±16	117±21
		t test	1.2		-0.03		-0.4		-0.3	
		p value	0.9 NS		0.9 NS		0.6 NS		0.7 NS	
	2nd	Mean ±SD	115.4 ± 16	117.4 ± 20	115.9±16	117±20	115±16	117±14	116±16	117±20
		t test	0.4		-0.35		-0.3		-0.3	
		p value	0.6 NS		0.7 NS		0.7 NS		0.7 NS	
DBP (mmHg)	1st	Mean ±SD	67.9±10.2	68.4±9.9	68±8.8	69±9.6	68±10	68±9	67±9	69±9
		t test	0.2		-0.4		-0.2		-0.7	
		p value	0.8 NS		0.6 NS		0.7 NS		0.4 NS	
	2nd	Mean ±SD	68.4±8.2	70.2±9.9	68±9.6	70.5±10	68±9	69±10	68±10	69±10
		t test	0.8		-1.03		-0.4		0.3	
		p value	0.4 NS		0.3 NS		0.6 NS		0.7 NS	
MAP (mmHg)	1st	Mean ±SD	84.2±11.8	84.4±12.7	84 ± 11	85±12	81±18	84±13	83±10	82±10
		t test	0.4		-0.3		-0.9		0.2	
		p value	0.8 NS		0.7 NS		0.3 NS		0.7 NS	
	2nd	Mean ±SD	83.2±10.8	85.8±12.4	84 ± 11	85±12	83±10	85±12	84±11	85±12
		t test	0.1		-0.6		-0.3		-0.3	
		p value	0.3 NS		0.5 NS		0.6 NS		0.7 NS	
RR (br/min)	1st	Mean ±SD	19.8±2.8	19.4±3.8	23±2	21±2	22±2	20±1.3	21±2	20±2
		t test	0.4		0.2		2.2		1.5	
		p value	0.6 NS		0.002 *		0.02 *		0.7 NS	
	2nd	Mean ±SD	19.8±2.5	19.8±1.8	23±2.9	21±2	21±2.8	21±1.6	20±2	20±1
		t test	0.1		0.2		0.8		1.1	
		p value	0.8 NS		0.03 *		0.3 NS		0.2 NS	
SpO2	1st	Mean	98.4±1.1	98.1±1.5	98±0.9	98±1.2	98±1	98±1	98±0.8	98±1.5

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(%)		±SD								
		t test	0.9		0.6		-0.1		0.8	
		p value	0.3 NS		0.5 NS		0.9 NS		0.3 NS	
	2nd	Mean ±SD	98.5±1	98±1.6	98±1	98±1.4	98±0.9	97±1.2	98±0.8	98±1.3
		t test	0.16		0.7		2.2		0.9	
		p value	0.1 NS		0.4 NS		0.02 *		0.3 NS	

Table (9) presents that HR, SBP, DBP, MAP, and SPO^2 didn't show significance statistical differences regarding the baseline assessment at the two assessment times between the study and the control group. In contrast, RR demonstrated significant statistical differences were observed immediately, and 30 minutes post intervention ($t=3.9$, $p \leq 0.05$ and $t=2.6$, $p \leq 0.05$) respectively at the first assessment time. As well, RR demonstrated significant statistical difference immediately post intervention only ($t=3.1$, $p \leq 0.05$) at the second assessment time.

Table (9): Comparison between Means Hemodynamic Parameters of Study and Control Group at the Second Day at Different Assessment Times (N=70):

Hemodynamic parameters	Assessment		Pre-intervention		Immediate post intervention		0.5h post intervention		One hour post intervention	
			Study group	Control group	Study group	Control group	Study group	Control group	Study group	Control group
			n=35	n=35	n=35	n=35	n=35	n=35	n=35	n=35
HR (bt/ min)	1st	Mean ±SD	97.1±16	99.8±24.3	97±16	99±23	97±15	102±19	97±16	102±18
		t test	0.5		-0.4		-1.2		-1.2	
		p value	0.5 NS		0.6 NS		0.2 NS		0.2 NS	
	2nd	Mean ± SD	97±16.4	97.1±28	97±15	99±23	96±16	102±19	97±15	102±20
		t test	0.02		-0.3		-1.3		-1	
		p value	0.9 NS		0.7 NS		0.18 NS		0.2 NS	
SBP (mmHg)	1st	Mean ± SD	116.5±17	117.6±19	116±16	115±26	116±16	117±18	115±16	117±19
		t test	0.2		0.1		-0.4		-0.4	
		p value	0.8 NS		0.8 NS		0.6 NS		0.6 NS	
	2nd	Mean ±SD	114.4±16.4	118±20	116±16	118±19	116±16	117±19	114±15	117±18
		t test	0.8		-0.6		-0.3		-0.8	
		p value	0.4 NS		0.5 NS		0.7 NS		0.3 NS	
DBP (mmHg)	1st	Mean ±SD	68.1±8.3	71.8±9.6	68±8	70±10	68±8	71±9	67±8	70±9
		t test	1.7		-1		-1.6		-1.4	
		p value	0.09 NS		0.2 NS		0.1 NS		0.14 NS	
	2nd	Mean ±SD	68.2±8	71.5 ±9.5	68±8	71±10	68±8	70±10	68±9	70±9
		t test	1.5		-1		-0.7		-1.0	
		p value	0.12 NS		0.2 NS		0.4 NS		0.3 NS	
MAP (mmHg)	1st	Mean ±SD	84.4±10.5	86.5±13	83±10	86±10	83±10	86±11	83±10	86±11

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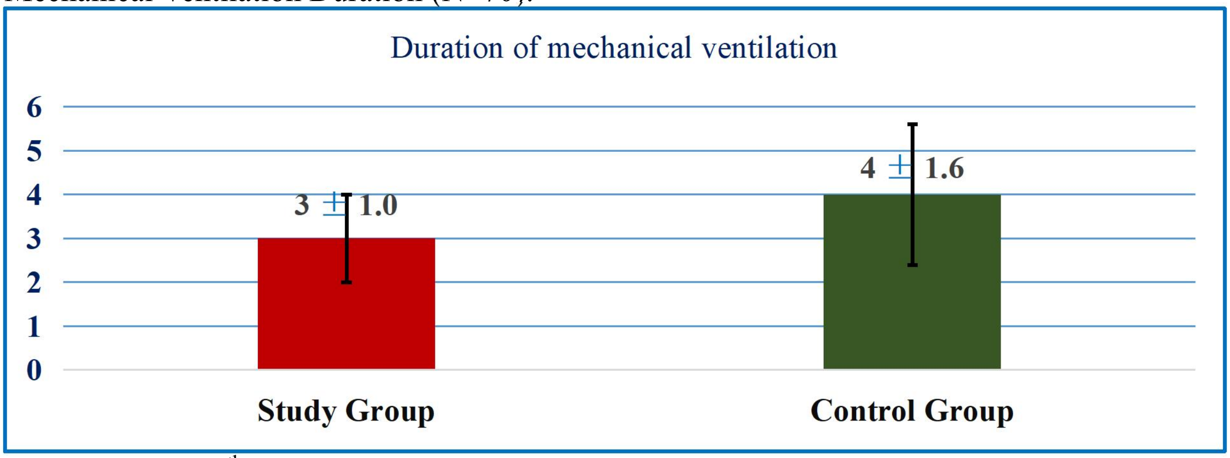
		t test	0.7		-0.8		-1		-1.0	
		p value	0.4 NS		0.4 NS		0.3 NS		0.2 NS	
	2nd	Mean ±SD	83.3±10.1	86.5±12	84±10	86±12	84±10	86±12	83±10	85±11
		t test	1.1		-1		-0.7		-1.0	
		p value	0.2 NS		0.3 NS		0.4 NS		0.2 NS	
RR (br/min)	1st	Mean ±SD	20±2	20.3±1.5	23±2	21±2	22±2	20±1.5	21±1.9	20±1
		t test	0.6		3.9		2.6		0.8	
		p value	0.5 NS		0.00 **		0.01 **		0.3 NS	
	2nd	Mean ±SD	20±2.7	20±1.3	23±2	21±2	21±2	21±1.5	20±2	20±1.7
		t test	0.16		3.1		1.1		1.2	
		p value	0.8 NS		0.002**		0.2 NS		0.2 NS	
SpO2 (%)	1st	Mean ±SD	98.3±1	97.71.6±	98±1	98±1	98±1	97±1.7	98±0.9	98±1.5
		t test	1.8		0.4		1.3		0	
		p value	0.07 NS		0.6 NS		0.17 NS		1 NS	
	2nd	Mean ±SD	97.8±1.7	98±1.3	98±0.8	97±1.5	98±0.9	97±1.4	98±0.7	98±1.1
		t test	0.5-		0.1		1.3		0	
		p value	0.5 NS		0.3 NS		0.18 NS		1 NS	

As regards the 3rd research hypothesis that states that: mechanically ventilated patients who will be exposed to acupressure protocol of care will have shorter duration of mechanical ventilation as compared to a matched control group (fig.1).

Figure (1) indicates that the mean duration of mechanical ventilation of the study group was 3±1, and in the control group was 4±1.6 with no statistically significant difference (t=26, $p \leq 0.05$).

Figure (1): Comparison between Mean / Standard Deviation of the Study and Control Groups in Regards Mechanical Ventilation Duration (N=70):



As regards the 4th research hypothesis states, mechanically ventilated patients who will be exposed to acupressure protocol of care will exhibit fewer complications as compared to a matched control group (figure 2).

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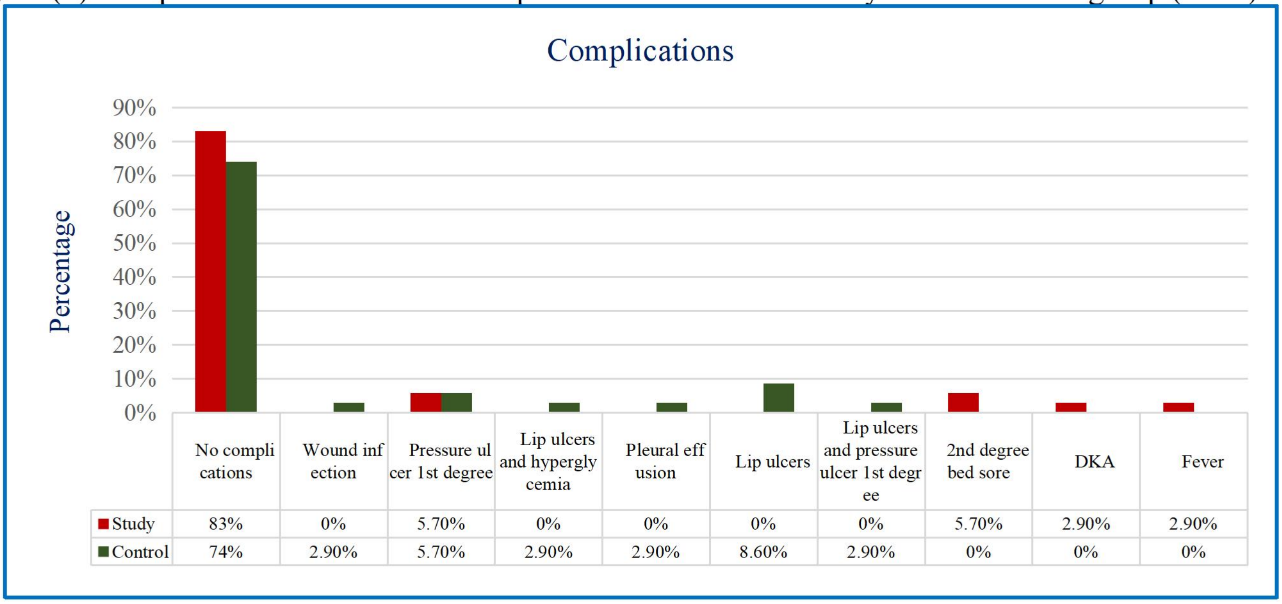
Figure (2) demonstrates that there is no statistically significant difference between study group and complications (X^2= 11.2, p $\geq$ 0.05). Approximately Two thirds of the total study sample had no complications. 83 % of the study group and 74 % of the control group had no complications.

Figure (2) Comparison of incidence of complications between the study and the control group (n=70).



Additional findings and correlations:

Table (10) presents statistically significant positive correlation between the number of intervention days and both mechanical ventilator duration (r = 0.60, p $\leq$ 0.05) and length of hospital stay (r = 0.27, p $\leq$ 0.05), indicating that longer intervention periods are associated with increased ventilator use and longer hospitalization. MUAC was significantly positively correlated with pre-intervention minute ventilation (VE) (r = 0.24, p $\leq$ 0.05). Post-intervention tidal volume and minute ventilation were significantly associated with pre- and post-RSBI (p $\leq$ 0.05), showing strong inverse relationships (e.g., post-RSBI and post-intervention VT, r = –0.80, p $\leq$ 0.05), indicating that improved tidal volumes were linked to better weaning readiness (lower RSBI scores).

Table (10): Correlation between medical data and weaning indices of the study groups (N=70)

Variables		Age	Length of stay	Mechanical ventilator duration	Days of intervention	MUAC	Pre-intervention tidal volume	Post-intervention tidal volume	Pre-intervention Minute ventilation.	Post-intervention Minute ventilation.	Pre-RSBI
Length of stay	r	0.03									
	p	0.7									
Mechanical ventilator duration	r	-0.1	0.17								
	p	0.4	0.15								
Days of intervention	r	-0.07	0.27	0.6							
	p	0.5	0.02*	0.000***							
MUAC	r	0.27	-0.01	0.003	-0.19						
	p	0.02*	0.9	0.9	0.11						

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Pre-intervention tidal volume (VT)	r	0.02	-0.16	-0.008	0.03	0.15					
	p	0.8	0.17	0.9	0.8	0.2					
Post-intervention tidal volume (VT)	r	-0.05	-0.2	-0.14	-0.006	0.07	0.8				
	p	0.7	0.06	0.2	0.9	0.5	0.000***				
Pre-intervention minute ventilation (VE)	r	0.004	-0.11	0.08	0.13	0.24	0.68	0.6			
	p	0.97	0.35	0.5	0.3	0.04*	0.000***	0.000***			
Post-intervention minute ventilation (VE)	r	0.009	-0.16	-0.14	-0.02	0.07	0.5	0.8	0.7		
	p	0.9	0.18	0.3	0.8	0.5	0.000***	0.000***	0.000***		
Pre-RSBI	r	0.02	0.18	0.01	0.07	-0.15	-0.8	-0.6	-0.3	-0.2	
	p	0.8	0.12	0.9	0.5	0.2	0.000***	0.000***	0.004**	0.05*	
Post – RSBI	r	0.003	0.2	0.18	0.03	-0.1	-0.75	-0.8	-0.4	-0.5	0.8
	p	0.9	0.09	0.13	0.8	0.3	0.000***	0.000***	0.000***	0.000***	0.000***
*Statistical difference, RBSI: Rapid Shallow Breathing Index, MUAC: Mid Upper Arm Circumference											

Table (11) presents several significant associations as the following: days of intervention demonstrates a moderate positive correlation with both length of stay ($r = 0.30$, $p \leq 0.05$) and mechanical ventilator duration ($r = 0.60$, $p \leq 0.05$), indicating that longer interventions were associated with extended hospitalization and ventilator use. Also, MUAC showed a significant positive correlation with age ($r = 0.20$, $p \leq 0.05$). Regarding hemodynamic parameters, systolic blood pressure post-intervention (SBP post) is significantly correlated with both heart rate post ($r = -.20$, $p \leq 0.05$), systolic blood pressure pre-intervention ($r = .90$, $p \leq 0.05$), and age ($r=0.2$, $p \leq 0.05$). Similarly, diastolic blood pressure (DBP) and mean arterial pressure (MAP), both pre- and post- intervention, demonstrated strong inter-correlations (all $r \geq .70$, $p \leq 0.05$). Respiratory rate post-intervention (RR post) correlated significantly with MAP post ($r = .20$, $p \leq 0.05$) and SpO_2 post ($r = .80$, $p \leq 0.05$). Of particular note, SpO_2 pre- and post-intervention were negatively correlated with mechanical ventilator duration ($r = -.40$, $p \leq 0.05$, and $r = -.40$, $p \leq 0.05$, respectively).

Table (11): Correlation between medical Data and hemodynamic parameters (n=70)

Variables		Age	Length of stay	ventilator duration	Days of intervention	MUAC	HR. Pre	HR. post	SBP. Pre	SBP. Post	DBP. Pre	DBP. Post	MAP. Pre	MAP. Post	RR. Pre	RR. Post	Spo2. Pre
Length of stay	r	0.04															
	p	0.7															

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Mechanical ventilator duration	r	-0.1	0.2														
	p	0.4	0.1														
Days of intervention	r	-0.07	0.3	0.6													
	p	0.5	0.02*	0.00**													
MUAC	r	0.2	-0.01	0.002	-0.19												
	p	0.02*	0.9	0.9	0.1												
HR. Pre	r	0.04	0.06	-0.13	0.006	0.07											
	p	0.7	0.5	0.2	0.9	0.5											
HR. post	r	-0.01	0.05	-0.09	0.03	-0.04	0.9										
	p	0.9	0.6	0.4	0.8	0.7	0.00**										
SBP. Pre	r	0.2	-0.04	0.14	0.05	0.12	-0.2	-0.3									
	p	0.05*	0.7	0.2	0.7	0.3	0.12	0.03*									
SBP. Post	r	0.2	-0.06	0.14	0.02	0.14	-0.16	-0.2	0.9								
	p	0.03*	0.6	0.2	0.8	0.2	0.2	0.04*	0.00**								
DBP. Pre	r	0.08	0.1	0.2	0.09	0.09	-0.1	-0.2	0.7	0.7							
	p	0.5	0.4	0.1	0.4	0.4	0.3	0.1	0.00**	0.00**							
DBP. Post	r	0.1	0.1	0.2	0.08	0.06	-0.1	-0.2	0.7	0.7	0.9						
	p	0.4	0.4	0.1	0.5	0.6	0.2	0.12	0.00**	0.00**	0.00**						
MAP. Pre	r	0.2	0.03	0.2	0.07	0.13	-0.2	-0.3	0.9	0.9	0.9	0.9					
	p	0.1	0.7	0.17	0.6	0.3	0.1	0.03*	0.00**	0.00**	0.00**	0.00**					
MAP. Post	r	0.2	0.02	0.1	0.04	0.1	-0.2	0.2	0.9	0.9	0.9	0.9	0.9				
	p	0.1	0.8	0.3	0.6	0.3	0.15	0.04*	0.00**	0.00**	0.00**	0.00**	0.00**				
RR. Pre	r	0.0	0.0	0.01	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.3	0.2	0.2			

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		5	7		9	2	7										
	p	0.6	0.6	0.9	0.4	0.8	0.5	0.4	0.1	0.1	0.04*	0.03*	0.07	0.04*			
RR. Post	r	0.02	0.06	-0.01	-0.01	-0.01	-0.01	0.00	0.2	0.18	0.2	0.2	0.2	0.2	0.8		
	p	0.8	0.6	0.8	0.8	0.8	0.8	0.9	0.1	0.1	0.06	0.03*	0.07	0.04*	0.00*		
Spo2. Pre	r	-0.2	-0.2	-0.4	-0.1	-0.1	-0.1	-0.06	-0.1	-0.2	-0.2	-0.17	-0.14	-0.14	-0.14	-0.1	
	p	0.1	0.09	0.00*	0.2	0.3	0.4	0.6	0.3	0.2	0.2	0.14	0.2	0.2	0.2	0.4	
Spo2. Post	r	-0.3	-0.2	-0.4	-0.03	-0.08	-0.08	-0.06	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.2	-0.12	0.8
	p	0.03*	0.13	0.001**	0.8	0.5	0.5	0.6	0.2	0.1	0.3	0.3	0.3	0.3	0.15	0.3	0.00**

HR: heart rate; SBP: systolic blood pressure; DBP; diastolic blood pressure; MAP: mean arterial blood pressure, RR: respiratory rate, SpO2: peripheral oxygen saturation, *Statistical difference, MUAC: Mid Upper Arm Circumference

4. Discussion:

The following discussion covers the focus findings related to the stated hypotheses of the study. A discussion of the findings is presented in the following sequence: section I description of the studied sample as regards to demographic and medical characteristics, section II: weaning indices values of the study group subjects as compared to a matched control group, section III: hemodynamic parameters values of the study group subjects as compared to a matched control group, and section IV: outcomes of the study group subjects as compared to a matched control group.

The present study delineated that, one third of the age group of total study sample was divided into three equal groups as the following young adult, middle-aged adult, and elderly with nearly equal distribution for each age group classification, with mean age of 49.8 + 12.9. These findings were similar to Abdel Hafez et al., (2022) in a study titled "Effect of Autogenic Drainage &Acupressure on the Respiratory Outcomes of Non-Invasive ventilated Chronic Obstructive Pulmonary Disease Patients" reported that a mean of age of total study subjects was 47.80 ± 10.97.

Also, AminiSaman et al., (2018) was in agreement with the current study findings in a study titled "Transcutaneous Electrical Nerve Stimulation at the Acupuncture Points to Relieve Pain of Patients Under Mechanical Ventilation: A Randomized Controlled Study" reported that the mean age of the intervention and sham groups was 40.76 ± 5.42 and 42 ± 6.07 years respectively. In the contrast, these results not in agreement with, Yücel and Eser (2015) in a study titled "Effects of hand massage and acupressure therapy for mechanically ventilated patients" reported that a mean age of mechanically ventilated patients was 64.90±12 years. These findings, from the researcher's point of view, the mechanically ventilated patients who will benefit from acupressure and other complementary medicine may be younger or middle-aged adults. Despite the review of literature, it didn't recommend specific ages to perform any technique from complementary medicine to the critically ill patients.

The present study revealed that more than two thirds of total study sample were males. These results were in agreement with the findings of Abdel Hafez et al., (2022) in a study titled "Effect of autogenic drainage

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&acupressure on the respiratory outcomes of non-invasive ventilated chronic obstructive pulmonary disease patients” reported that two third of all study subjects were male. Also, not in agreement with Harorani et al., 2023 in a study titled " Corrigendum to “The effect of Shiatsu massage on agitation in mechanically ventilated patients: A randomized controlled trial" reported that half of total study subjects were male. These findings from the researcher point of view, the two groups of study sample were matched regarding the gender variability, in addition to that acupressure was beneficial for male and female, and it provides safe, gentle and emotional touch for promoting the wellbeing in human population Mehta et al., (2017). Also, the results of the present study were supported with the literature review regarding the gender differences and ICU admission. As Todorov et al., (2021) were reported that women had a lower likelihood to be admitted to the ICU than men.

The current study showed that two thirds of the total study sample was non-smokers, and one half of the smokers were smoking 20 cigarettes per day. This finding supported by Maa et al., (2013) in a study titled " Acupressure Improves the Weaning Indices of Tidal Volumes and Rapid Shallow Breathing Index in Stable Coma Patients Receiving Mechanical Ventilation: Randomized Controlled Trial" showed that the majority (68 %) of the total study sample were nonsmokers and quarter of the smokers were smoking less than 20 cigarettes and the rest were smoking 20 cigarettes and more per day.

In the same context, these results were supported by Chen et al., (2023) in a study titled "Acupuncture for ventilator-dependent patients at a hospital-based respiratory care center: A randomized controlled trial" reported that 64 % of the study participants were nonsmokers. From the researcher points of view, smoking affects negatively on the mechanically ventilated patient outcomes so, the nonsmokers' participants are expected to get more benefits from any technique that improves the mechanically ventilated patient outcomes. As well, both study and control groups were matched regarding smoking habits.

The current study showed that two thirds of total study sample had free past medical history, indicating that the majority of the study sample represented relatively healthy individuals prior to ICU admission. These findings were supported by Abdel Hafez et al., (2022) in a study titled “Effect of Autogenic Drainage &Acupressure on the Respiratory Outcomes of Non-Invasive ventilated Chronic Obstructive Pulmonary Disease Patients” as they were reporting that 70% of study sample were had free past medical history.

Also, these findings were in agreement with Harorani et al., (2023) in a study titled "The effect of Shiatsu massage on agitation in mechanically ventilated patients: A randomized controlled trial" reported that two third of total study sample was had free past medical history. As well, these findings were in agreement with Ibrahim et al. (2022), in a study titled "Efficacy of Acupressure on Post-Operative Pain, Anxiety Level and Sleep quality for Abdominal Surgical Patients" concluded that half of total study sample were had free past medical history. In the contrast, these findings not in agreement with Başak et al., (2024) in a study titled with "The Effects of Self-Acupressure on Pain and Sleep Quality in Patients with Coronary Artery Disease: A randomized Controlled Trial” reported that majority of total study sample had past medical history.

These findings, from the researcher point of view, the acupressure protocol of care is beneficial for any target group with different diagnosis, and for better outcomes regarding the critically ill patients’ general condition, it is preferred for all patients to be free of past medical history. This characteristic may have contributed to the homogeneity of the study groups and reduced the influence of co morbidities on the outcomes.

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The current study showed that the mean length of ICU stay of the study group was lesser than the control group without significant statistical difference. This finding was in agreement with Chen et al., (2023) in a study titled " Acupuncture for ventilator-dependent patients at a hospital-based respiratory care center: A randomized controlled trial" reported that, the mean length of ICU stay of the study group was lesser than the control group. In contrast, this finding was not in agreement with Matsumoto et al., (2018) in a study titled "Efficacy of Acupuncture Treatment for Improving the Respiratory Status in Patients Receiving Prolonged Mechanical Ventilation in Intensive Care Units: A Retrospective Observational" reported that the mean length of ICU stay of total study sample was 31 days.

These findings from the researcher's perspective, the inclusion and exclusion criteria of the current study support selecting mechanically ventilated patients who are planned for weaning, to maximize the benefits of the care protocol. The protocol was applied daily until the patient was successfully weaned and discharged from the ICU.

The current study revealed that the mean length of mechanical ventilation duration of study group was lesser than the mean length of mechanical ventilation duration of the control group. These findings were in agreement with Liu et al. (2019) in a study titled "Effect of ultrasound-guided acupoint electrical stimulation on diaphragmatic dysfunction associated with mechanical ventilation" reported that acupressure was a factor in shortening the mechanical ventilation time.

Also, these results were in agreement with Maa et al., (2013) in a study titled with "Acupressure Improves the Weaning Indices of Tidal Volumes and Rapid Shallow Breathing Index in Stable Coma Patients Receiving Mechanical Ventilation: Randomized Controlled Trial" reported that mean duration of mechanical ventilation for the group that received two days acupressure had lower duration of mechanical ventilation than the two groups who received one day acupressure and standard of care. These findings were similar to Ben-Arie et al., (2023) in a study titled "Acupuncture reduces mechanical ventilation time in critically ill patients: A systematic review and meta-analysis of randomized control trials" reported that a significant reduction in the total number of MV days.

These findings, from the researcher point of view, the acupressure protocol of care encompasses a lot of biochemical and hormonal changes that lead to improve respiratory system functions thus effect positively on the critically ill patients undergoing of mechanical ventilator. While direct evidence linking acupressure to reduced mechanical ventilation duration is limited, and the effectiveness of acupressure in reducing the length of mechanical ventilation remains inconclusive.

The current study reported that, mean mid upper arm circumference of study group was similar to the mean mid upper arm circumference of control group. It meant the estimated body mass index of both groups were within normal as a matching criteria item. These findings were in agreement with Chen et al., (2023) in a study titled "Acupuncture for ventilator-dependent patients at a hospital-based respiratory care center: A randomized controlled trial" reported that the study group and control group were matched regarding the body weight.

These findings were supported by Matsumoto., et al., (2018) in a study titled" Efficacy of Acupuncture Treatment for Improving the Respiratory Status in Patients Receiving Prolonged Mechanical Ventilation in Intensive Care Units: A Retrospective Observational Study" reported that the study and control groups had normal body mass index. From the researcher's point of view obesity can influence the effectiveness of acupressure, particularly in terms of point location, pressure application, and treatment outcomes. Obesity can alter the body's anatomical landmarks, potentially making it more challenging to locate acupressure points accurately. The presence of excess adipose tissue may require practitioners to apply deeper or more sustained pressure to effectively stimulate acupressure points.

As well, by reviewing the literature, although it can affect how acupressure is applied and how effective it is, the presence of fat tissue does not make acupressure ineffective. Although there is little research on

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this topic, several studies and professional opinions indicate that fat tissue may have the following effects on acupressure pressure transmission to effectively stimulate underlying acupoints, fat tissue might need more pressure. To ensure that the desired pressure reaches the target area, practitioners frequently modify their techniques to account for this (Hanks, 2022).

The current study findings revealed a noticeable improvement in the weaning indices among the study group after acupressure application. VT and VE significantly increased at different assessment times compared with the baseline, indicating an enhancement in the patients' ventilatory performance. On the other hand, RSBI showed a significant reduction, which reflects better breathing pattern and improved readiness for weaning. These results are consistent with the physiological rationale that acupressure may promote relaxation, optimize respiratory muscle function, and consequently improve ventilatory efficiency. Furthermore, the persistence of this pattern across different assessment times during the first and second days suggests a sustained beneficial effect rather than a transient response as reported in the literature review.

These findings were consistent with those reported by Maa et al. (2013) in a study titled " Acupressure improves the weaning indices of tidal volumes and rapid shallow breathing index in stable coma patients receiving mechanical ventilation: A randomized controlled trial" found that applying acupressure to mechanically ventilated patients significantly increased VT and improved RSBI. Also, the study results were supported by Chen et al. (2023) in a study titled " The effects of acupressure on respiratory outcomes among mechanically ventilated patients: A randomized controlled trial" reported that patients exposed to acupressure exhibited increased VT and VE compared to baseline, attributing this improvement to enhanced parasympathetic activity.

As well as these findings were supported by the work of Han, Lee, and Park., (2024) in a study titled " Acupressure as adjunctive therapy in ICU: A meta-analysis" reported that acupressure enhances gas exchange and airflow via neuromodulation, which has a positive impact on respiratory efficiency. Also, these results demonstrated the potential of acupressure as a non-pharmacologic method to support pulmonary function while weaning off a ventilator. Also, in agreement with Matsumoto et al., (2018) in a study titled "Efficacy of Acupuncture Treatment for Improving the Respiratory Status in Patients Receiving Prolonged Mechanical Ventilation in Intensive Care Units: A Retrospective Observational" reported that Acupuncture treatment might have beneficial effects on the respiratory status of ICU patients receiving MV and may help in weaning from prolonged MV.

These findings, from the researcher point of view, the significant increase in VT and VE following the intervention indicated improved respiratory muscle performance and ventilation efficiency as a reflection of the physiological effect of acupressure. More importantly, the observed reduction in RSBI reinforced the potential of acupressure to enhance weaning readiness. The consistency of these improvements across both days and multiple post-intervention time points highlighted the sustained physiological benefits of acupressure. These results supported the integration of acupressure as a complementary approach in ventilator weaning protocols for critically ill patients.

The current study reveals that, in the control group, who received only routine care, VT and VE showed a statistically significant increase after the routine care compared with baseline. This improvement may be attributed to the effect of standard nursing care and ventilatory support rather than the specific impact of acupressure. However, the rapid shallow breathing index did not show any significant change across the different assessment times, indicating that routine care alone was not sufficient to enhance the patients' breathing pattern or readiness for weaning.

These findings were aligned with a study that was conducted by Turhan et al., (2024) titled " Predictive Value of Serial Rapid Shallow Breathing Index Measurements for Extubation Success in Intensive Care Unit Patients" reported that routine ICU care and structured ventilatory management can lead to improvements in VT and VE, even in the absence of adjunctive complementary interventions. In contrast,

these results were not in agreement with Vahedian-Azimi et al., (2020) in a study titled " Protocolized ventilator weaning verses usual care: A randomized controlled trial " reported observing no significant improvements in RSBI or VE over time.
As well, the study findings were not in agreement with Navidhamidi et al., (2019) in a study titled "The effect of acupressure on respiratory indices in patients undergoing mechanical ventilation" reported that, there was no significant difference in the mean expiratory tidal volume across all time points of the first session compared to the subsequent sessions within the control group. This indicates that the expiratory tidal volume remained stable throughout the two days of intervention in the control group.

These findings from the researcher perspective, the observed statistically significant changes in VT and VE in the control group suggest that routine care alone may contribute to clinical variability in ventilatory parameters. As the routine care included chest physiotherapy sessions, suctioning, and changing position according to preset schedule. However, the lack of significant difference in the rapid shallow breathing index (RSBI) may indicate that RSBI is a relatively stable parameter that is less sensitive to routine care.
The findings of the current study revealed no statistically significant differences between the study and control groups at baseline, which confirms the initial homogeneity of the two groups. However, after the intervention, significant differences emerged in favor of the study group regarding tidal volume and minute ventilation at both the first and second assessment times, immediately, 30 minutes, and one hour post intervention. This improvement reflects the positive impact of acupressure in enhancing ventilatory performance compared to routine care alone. In relation to the rapid shallow breathing index, significant differences were detected between the two groups at several time points after the intervention, with lower RSBI values in the study group, indicating a more favorable readiness for weaning. These results highlight that while routine care produced minimal changes, the addition of acupressure yielded a sustained and clinically relevant improvement in weaning indices.

These findings were aligned with Navidhamidi et al., (2019) in a study titled " The effect of acupressure on respiratory indices in patients undergoing mechanical ventilation" as reported that, the intervention group, acupressure was effective on the amount of spontaneous minute volume in each session compared with the pre-interventional level, so that at the first, second and third session, the effective intervention was up to 30 minutes and at the fourth session, only in the immediate after of the intervention. Therefore, the effect of acupressure in each session was sectional.
Also, these findings were consistent with Maa et al., (2013) in a study titled " Acupressure Improves the Weaning Indices of Tidal Volumes and Rapid Shallow Breathing Index in Stable Coma Patients Receiving Mechanical Ventilation: Randomized Controlled Trial" reported that the acupressure group achieved superior weaning indices compared to the control group. Specifically, patients receiving acupressure demonstrated significantly higher VT and VE, along with lower RSBI at multiple time points post-intervention across two consecutive days. In addition to, Chen et al., (2023) in a study titled "Acupuncture for ventilator-dependent patients at a hospital-based respiratory care center: A randomized controlled trial" reported that significant improvements in tidal volume, minute ventilation, and reductions in the rapid shallow breathing index compared with standard care.

These findings, from the researcher perspective, the consistent post-intervention improvements in VT, VE, and RSBI were observed in the study group underscore the potential clinical value of acupressure in facilitating the weaning process from mechanical ventilation. The absence of significant differences at baseline confirms that both groups were comparable prior to the intervention, strengthening the validity of the subsequent findings. The reduction in the rapid shallow breathing index at key intervals further supports the interpretation that acupressure may promote more efficiency which are crucial predictors of extubation success. These findings align with the theoretical framework that acupoint stimulation can modulate respiratory muscle activity, thereby providing physiological advantages during the critical phase of ventilator liberation.

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The findings of the current study demonstrated that HR, DBP, MAP, and SpO_2 remained stable after acupressure in the study group, with no statistically significant differences across different assessment times on both study days. This stability suggests that the intervention did not affect the hemodynamic status of mechanically ventilated patients. In contrast, a significant increment in RR was observed, particularly at the first and second days at different assessments. This increment may reflect a transient physiological response to stimulation. A significant change in SBP was noted only at the second assessment time of the second day. However, this variation was clinically small and unlikely to indicate adverse cardiovascular stress.

These findings were supported by Barış et al. (2023) in a study titled " The effect of acupressure on pain level and hemodynamic parameters after coronary angiography: a randomized controlled study" reported that acupressure had no significant effect on SBP, HR, or SpO2 values, and it produced significantly higher DBP and RR values at the 20th and 30th min in the study group. As well as the results were aligned with Maa et al., (2013) in a study titled " Acupressure Improves the Weaning Indices of Tidal Volumes and Rapid Shallow Breathing Index in Stable Coma Patients Receiving Mechanical Ventilation: Randomized Controlled Trial" showed that no statistical differences in physiological parameters within the study group even for one day acupressure or two days acupressure, and disagreed with the study results in RR as reported there was no any statistical difference also.
Also, these findings were not in agreement with Moslehi et al., (2021) in a study titled " The effect of acupressure on the level of the blood pressure, respiratory rate, and heart rate in patients with the brain contusion under mechanical ventilation" as reported the mean of two consecutive days of blood pressure, heart rate, and respiratory rate after acupressure in the intervention group exhibited a statistical differences after acupressure. From the researcher point of view, the overall stability of HR, SBP, DBP, MAP, and SpO_2 indicates that acupressure can be applied safely without adverse hemodynamic effects. The consistent and significant change in RR across both days suggests a positive influence on respiratory function, likely through autonomic modulation.

The findings of the current study demonstrated that, for the control group that received routine care, HR, SBP, and MAP showed no statistically significant differences across assessment times on both study days. A significant increment in RR was observed at the first and second assessment times of the first and second day. This may reflect normal physiological variability or the influence of the routine ICU care rather than the effect of acupressure. On the second day, DBP demonstrated a small but statistically significant variation across assessment times, while SpO_2 also showed a minor significant change at the first assessment time. Although statistically significant, these variations remained within normal physiological ranges and are unlikely to be of clinical concern.
These findings were supported by Barış et al. (2023) in a study titled " The effect of acupressure on pain level and hemodynamic parameters after coronary angiography: a randomized controlled study" reported that no statistical difference within the control group at different assessment times in relation to hemodynamic parameters including DBP and RR. As well as, the study findings were supported by Ister & Altinbas, (2023) in a study titled " Effect of Acupressure on the Blood Pressure, Heart Rate, and Pain Severity of Patients who Underwent Coronary Angiography: A Randomized Controlled Trial " reported that there was no statistical difference within the control group regarding all hemodynamic parameters.

At the same context, the results were aligned with Moslehi et al., (2021) in a study titled " The effect of acupressure on the level of the blood pressure, respiratory rate, and heart rate in patients with brain contusion under mechanical ventilation" as reported that the control group didn't exhibit any statistical difference within the group. From the researcher's perspective, the observed stability in HR, SBP, DBP, and MAP within the control group across most assessment points reflects the effectiveness of routine ICU care in maintaining cardiovascular homeostasis among mechanically ventilated patients. However, the

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significant differences in RR, along with partial improvements in SpO_2, suggests that even in the absence of acupressure, routine care may still influence respiratory parameters through factors such as secretion clearance, patient comfort optimization, and sessions of physiotherapy.
When comparing the study and control groups; the current study revealed that HR, SBP, DBP, and MAP showed no statistically significant differences at either assessment time, indicating that the intervention did not affect cardiovascular stability. In contrast, RR demonstrated significant differences between the study groups. At the first assessment time, RR was significantly higher in the study group immediately and at 30 minutes post-intervention, while at the second assessment time, a significant difference was observed immediately post acupressure only. Similarly, SpO_2 showed a significant difference between groups at one hour post acupressure during the second assessment time. These findings suggest that the intervention had a measurable effect on respiratory parameters, which may reflect enhanced respiratory function.

In relation to the positive effect of acupressure on oxygen saturation, this finding was aligned with Mauliku, et al (2024) in a study titled "The Effect of Acupressure on Increasing Oxygen Saturation in Pneumonia Patients" reported that acupressure can increase oxygen saturation in the intervention group compared to control group. Also, these findings agreed with Barış et al. (2023) in a study titled " The effect of acupressure on pain level and hemodynamic parameters after coronary angiography: a randomized controlled study" reported that at the 20th and 30th minutes, the experimental group receiving acupressure demonstrated significantly higher RR compared with the control group; however, no significant differences were observed in SBP, HR, or SpO_2.

These findings disagreed with Moslehi et al., (2021) in a study titled " The effect of acupressure on the level of the blood pressure, respiratory rate, and heart rate in patients with the brain contusion under mechanical ventilation" as reported the mean of two consecutive days of blood pressure, heart rate after acupressure in the intervention group than control group was significantly different. But the respiratory rate at the same study was aligned with the current study finding. These findings, from the researcher point of view, acupressure did not lead to widespread differences in hemodynamic parameters, but it primarily influenced respiratory function, as evidenced by significant RR differences and occasional SpO_2 improvement, while maintaining overall hemodynamic stability in mechanically ventilated patients.
The results demonstrated no statistically significant difference between the study and control groups in terms of the incidence of complications. Approximately two-thirds of the total sample experienced no complications during the study period. Specifically, the majority of participants in the study group and two third of the control group did not develop any complications. Although the proportion of patients without complications was higher in the study group, the difference was not statistically significant. From the researcher point of view, this data may be related to the restricted inclusion and exclusion criteria. As well as the decreased length of ICU stay for the study group was linked with decreased incidence of complications. The absence of prior research in this area highlights the novelty of the present findings and emphasizes the need for further studies to explore the safety profile of acupressure in critically ill populations.

5. Conclusion:

According to the statistical analysis, it is determined that the acupressure application notably encompasses positive impact on weaning indices. While, it had positive impact on respiratory rate from all physiological parameters, indicating support of the stated research hypotheses. Additionally, acupressure has demonstrated safely among mechanically ventilated patients. However, limited data is available showing the need for continued research on complementary medicine application in the critical setting.

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6. Recommendations:

6.1- Recommendations for further researches:

6.1.1- Replication of this study on a larger probability sample in a different geographic area.

6.2- Recommendations based on the findings:

6.2.1- implementation of acupressure protocols should be accompanied by systematic monitoring of patient outcomes, staff adherence, and potential adverse events to ensure ongoing quality improvement.

6.2.2- Integration of acupressure into critical care education and practice: hospitals should consider incorporating an acupressure protocol into the routine care of mechanically ventilated patients to enhance weaning indices, improve respiratory performance.

6.2.3- Inclusion of complementary medicine in nursing guidelines and policies: national and institutional critical care nursing guidelines should be updated to recognize acupressure as a complementary, non-invasive, and cost-effective intervention that can be safely integrated with conventional mechanical ventilation management strategies.

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8. Conflict of interest:

No conflict of interest

9. References:

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