The Contributing Factors for Intensive Care Unit Acquired Weakness among Critical Ill Patients

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Abstract

Background: One of the most common complications of intensive care unit stay is neuromuscular dysfunction, this is a secondary disorder for other life-threatening conditions. Critically ill patients have severed muscle weakness and are risk group for intensive care unit acquired weakness which effected by several factors. **Ami:** This study aims to assess the contributing factors of intensive care unit acquired weakness among critically ill patients. **Design:** An exploratory descriptive research design was utilized to aim of this study. **Setting:** This study was conducted at critical care unit in Qasr Alini hospital affiliated to Cairo university hospitals. **Sample:** A purposive sample of 80 patients from both gender and patients after two weeks from admission was included in the study. **Tools:** Data was collected using four tools, tool I) Patients structured questionnaire that include two parts, part 1: patients Personal characteristics, part 2: Current & past history of patients, tool II) Medical research council scale for muscle strength, tool III) Contributing factors for intensive care unit acquired weakness, tool IV) Sequential organ failure assessment score. **Results:** this study revealed that majority of the studied patients had muscle weakness. There was a statistically significant relation between nutrition as modifiable contributing factors and the medical research council scale for muscle strength. While there was a statistically significant relation between age and gender as non-modifiable contributing factors and the medical research council scale for muscle strength. **Conclusion:** majority of the studied patients had muscle weakness. **Recommendation:** using the medical research council scale for muscle strength to diagnose intensive care unit acquired weakness should begin with a routine physical examination in all hospitals.

Keywords: *Acquired weakness, Contributing factors, Intensive care unit*

Introduction

Muscle weakness is a frequent problem in ICU patients, and it can be induced due to primary or secondary causes. Primary causes ($< 0.5\%$ of all ICU admissions) include neuromuscular pathologies that need intensive care, such as myasthenia gravis, multiple sclerosis, amyotrophic lateral sclerosis, and Guillain–Barre Syndrome, among other neurological disorders. Secondary causes correspond to treatment for other life-threatening conditions in the ICU. Intensive care unit acquired weakness (ICU-AW) affects the proximal rather than distal area of the limbs' muscles and the respiratory muscles. Muscle tone become diminished, and tendon reflexes may be reduced or normal. ICU-AW does not strain the face and eyes muscles **(Gonzalez etal., 2022).**

Intensive care unit (ICUAW) is a relatively common entity while the exact incidence is unknown. It is estimated that between 30% and 57% of patients staying in the ICU longer than 7 days will be diagnosed with this condition **(Taylor., 2023).** Intensive care units (ICUs) globally care for 13–20 million patients annually with ICUAW occurring in 25%–31% of medical and 57%–74% of surgical ICUs. Incidence varies by patient characteristics and can develop rapidly even within hours of admission or mechanical ventilation. ICU-AW can persist for years especially in patients ventilated for over 4–7 days and is common in elderly patients (up to 70%) **(Elkalawy etal., 2023).**

The pathological mechanism of ICU-AW is complex and has not been completely clarified. Multiple mechanisms may be involved in regulating muscle weakness. Protein imbalance: Continuous protein turnover in the muscles maintains the metabolic balance between protein synthesis and proteolysis. This balance is very important in the muscle tissue. In elderly persons occurs slows anabolism, creating an imbalance between the average rates of protein anabolism and catabolism. This leads to a negative protein balance and gradually loss of skeletal muscles occurs, thereby promoting the occurrence of sarcopenia **(Chen & Huang., 2024).**

Intensive care unit-acquired weakness (ICU-AW) is defined as clinically detected weakness in critically ill patients in whom there is no plausible etiology other than critical 31 Review of Literature illness. Using electrophysiological methods, patients with ICU-AW are classified in three subcategories: critical illness polyneuropathy (CIP), critical illness myopathy (CIM) and critical illness neuromyopathy (CINM). The involvement of the neuromuscular junction is also possible, mainly related to residual neuromuscular blockade. ICU-AW is a frequent complication occurring in critical ill patients with risk factors including illness severity and organ failure, age, hyperglycemia, parenteral nutrition, drugs and immobility. Due to short and long-term complications, ICU-AW results in longer hospital stays and increased mortality **(Tortuyaux etal., 2022).**

Significance of the study:

Intensive Care Unit-Acquired Weakness (ICU-AW) is a medium- and long-term complication in critically ill patients that affects quality of life by increasing morbidity and healthcare costs. Approximately 20 million people worldwide require admission to intensive care units (ICUs) each year. the incidence of ICU-AW is estimated to be around 25–30%, translating to an average of 3–6 million affected patients annually. The incidence is even higher in surgical ICUs, where certain studies report rates ranging between 50% and 70%. The prevalence of ICU-AW in critically ill patients can reach 50%, with up to 2% of muscle mass lost daily **(Petrucci etal., 2025).**

In Egypt, Intensive care unit-acquired weakness (ICU-AW) is a common neuromuscular dysfunction associated with cases in the ICU; it is a type of skeletal muscle dysfunction that usually occurs following hyperglycemia, mobility restriction, sepsis, and the use of neuromuscular blocking agents or glucocorticoids, also its reported that 53.3% of the patients had ICU acquired muscle weakness **Mostafa (2023).** As well the aim of the study was to assess the contributing factors for intensive care unit acquired weakness among critically ill patients.

Aim of the study:

The aim of this study was to assess the contributing factors for intensive care unit acquired weakness among critically ill patients.

Research Question:

What is the incidence of intensive care unit acquired weakness among critically ill patients?

What are the contributing factors for intensive care unit acquired weakness among critically ill patients?

Subjects and Methods:

Research Design:

Descriptive exploratory research design was used to achieve the aim of the study.

Setting:

This study was conducted at critical care unit in Qasr Alini hospital affiliated to Cairo university hospitals.

Sample:

A purposive sample of 80 patients, out of a total of 100 patients attended the above-mentioned setting in the previous year.

Inclusion criteria:

Adult patients from both genders and patients after two weeks from ICU admission.

Exclusion Criteria:

Patients who have neuromuscular disease (myasthenia gravis, spinal cord injury, Guillain-Barre syndrome, and stroke).

Tools of data collection:

Data was collected using the following tools.

Tool I: Patients structured questionnaire:

It was developed by investigator based on the literature review (**Mostafa 2023), (Fuentes-Aspe et al 2024) & (Watanabe et al 2023)** and it was filled in by the investigator included the following two parts:

Part one: Personal characteristics of the patients:

It used to assess personal characteristics which included age, gender, marital status, occupation and education level.

Part two: Current and past history of the patients:

The current history included medical diagnosis, duration of current admission & Glasgow coma scale (GCS) on admission. While the past history included pervious ICU admission, duration of previous ICU admission, history of chronic disease and duration of chronic disease.

Tool II: The medical research council scale for muscle strength:

It was adopted from (**Latronico & Gosselink 2015).** It was used to assess strength of muscle, from six muscles in the upper and lower limbs on both sides.

Scoring system: Grading system for muscle weakness; Muscle strength in each group was scored according to the 6-point medical research counseling system, which are; no visible contraction which was given grade zero, visible contraction without movements of the limbs equal grade 1, movements of the limbs but not against the gravity equal grade 2, movement against gravity over (almost) the full

range was given grade 3, active movement against gravity and resistance was given grade 4 and grade 5 was scored for presence of normal muscle power **Mostafa (2023).** The total score of medical research council scale is 60, which patients had ICU-AW if muscle strength score <48, while absences of ICU-AW if muscle strength score ranges from 48:60.

Tool III: The modifiable and non-modifiable contributing factors for intensive care unit acquired weakness:

It was adapted from (Chen & Huang 2024) to assess contributing factors for ICU-AW including modifiable contributing factors such as hyperglycemia, connected with mechanical ventilation and duration of mechanical ventilation, immobility, parental nutrition, & some medications (Vaso-active drugs, neuromuscular blocking agent, insulin therapy, sedative drugs and corticosteroids) and history of chronic diseases. Non- modifiable contributing factors such as age and gender.

The investigator adapted the items by rewording some statements and adding some items to assess the contributing factors for ICU-AW.

Tool IV: The sequential organ failure assessment score:

It was adopted from (Marshall 2001). It was used to measure organ failure (respiratory system, cardiovascular system, central nerves system, hepatic, coagulation and renal).

Scoring system: total score for SOFA score (24), which patients had low risk of multiple organ failure from (0:6), while patients had moderate risk of multiple organ failure from (7:12) & patients had high risk of multiple organ failure from (13:24).

Validity:

Content validity was conducted to determine whether the tools covered the aim, test its appropriateness, comprehensiveness, accuracy, correction, clearance and relevance through a jury of five experts (assistant professors of critical & medical surgical nursing) from the faculty of Nursing Helwan University and Badr University. Their opinions were elicited regarding tools consistency, rephrasing for some statements and ethics, values, culture and beliefs were respected.

Reliability:

Cranach's Alpha was used to determine the internal reliability of the adapted tools. Reliability of the questionnaire normally ranges between 0 and 1. Higher values of Cronbach's alpha (more than 0.7) denote acceptable reliability.

Reliability of contributing factors was tested using Cronbach's alpha. Its value was (0.762).

Reliability of sequential organ failure assessment score was tested using Cronbach's alpha. Its value was (0.715).

Reliability of medical research council scale for muscles strength was tested using Cronbach's alpha. Its value was (0.950).

Pilot Study:

The pilot study was done on10% (8) patients of the study sample to examine the clarity of questions and time needed to complete the study tools. Based on the results, no corrections and omissions of items were performed, so the patients were included in the study sample.

Field work:

- An approval was obtained from the Scientific Ethical Committee of Faculty of Nursing Helwan University and the study subjects.
- The investigator was explaining the aim of the study to conscious patients and the family of unconscious patients and took oral agrees for participation in this study to collect data.
- Data collection of the study was started and completed within six months in the period from beginning of January 2024 to the end of June 2024.
- The investigator visited the intensive care unit two days per week during day shift in morning & afternoon. Each day the investigator assessed four to five patients after two weeks from ICU admission.
- At the beginning the investigator obtained the patients data from medical files which include personal and medical data.
- The study tools were completed and filled in by the investigator within an average time of 25-45 minutes as follows: Patients structured questionnaires for collecting data regarding Personal data of the patients & Current and past history of patients it took 5-10 minutes. The Contributing factors for intensive care unit acquired weakness took about 5-10 minutes, Sequential organ failure assessment score took about 5-10 minutes and medical research council scale for muscle strength took about 10-15 minutes.

Ethical Considerations:

The ethical research considerations in this study include the following: -

- The research approval was obtained from the Ethics of Scientific Research Committee Faculty of Nursing Helwan University before starting the study. No (33) (29/3/2023).
- The investigator got approval from conscious patients and family of unconscious patients before beginning the data collection.
- Participation in the study was voluntary, and subjects had given complete full information about the study.
- The ethical considerations included explaining the purpose, nature of the study and confidentiality of the information.
- Ethics, values, culture and beliefs were respected.

Results:

Table (1): shows that 72.5% of the studied patients aged $50 \leq 60$ years with a mean age of 58.7 ± 16.7. 58.7% of them were female, and 67.5% of them were married. Regarding their occupation, 62.5 % of them are not working and 36.2% of them are primary education.

Table (2): shows that 68.7% of the studied patients were admitted to the hospital for a duration of 1 to 3 days. 52.5% of them were fully conscious, and 75% of them had a history of previous ICU admission. Additionally, 61.7% of the previously hospitalized patients remained in the hospital for more than 7 days. In terms of chronic disease history, 60% of the studied patients had hypertension, and 76.2% of them had been living with chronic diseases for more than 7 years.

Figure (1): shows that 85% of the studied patients had muscle weakness and 15% of them had no muscle weakness according to the total medical research council scale for muscles strength.

Table (3): shows that 63.2% of the studied patients with muscle weakness experienced hyperglycemia, while 66.2% were connected to mechanical ventilators. Among those ventilators, 91.4% of them remained connected for 1 to 3 days. Regarding immobility, 57.3% of the studied patients were mobile with assistance and 58.8% of them were able to take oral feeding. Additionally, 48.5% of the studied patients were regularly receiving vasoactive drugs and 66.2% of them had hypertension. Age emerged as a non-modifiable factor, 70.6% of the studied patients with muscle weakness aged from 50 to 60 years and 64.7% of them were female patients. Age was the highest incidence rate of non- modifiable contributing factors for intensive care unit acquired weakness representing 56%, while the medication was the lowest incidence rate of modifiable contributing factors for intensive care unit acquired weakness representing 38%.

Figure (2): Presents that 61.8% of the studied patients with muscle weakness have a low risk for organ failure while 32.4% of them have a moderate risk and only 5.8% of them have a high risk for sequential organ failure assessment score.

Table (4): presents that there was a high statistically significant relation between the educational level of the studied patients and total medical research council scale for muscle strength P (0.000). Also, there was a statistical significance relation between the age and gender of the studied patient and total medical research council scale for muscle strength at P (0.03 & 0.01) respectively. However, there were no statistically significant relations between the studied patients' marital status and occupation and total medical research council scale for muscle strength at (P 0.07 & 0.332).

Table (5): shows that there was a high statistically significant relation between the Glasgow coma scale of studied patients with muscle weakness and total medical research council scale for muscle strength as P (0.000). There was a statistical significance between the duration of current admission and duration of chronic disease of studied patients with muscle weakness and total medical research council scale for muscle strength as P (0.05). However, there were no statistically significant relations between the studied patients' previous ICU admission and history of chronic disease of studied patients with muscle weakness and total medical research council scale for muscle strength at P (0.911& 0.127).

Table (6): shows that There was a statistically significant relation between nutrition as modifiable contributing factors of the studied patients with muscle weakness and total medical research council scale for muscle strength as P(0.02). However, there were no statistically significant relations between hyperglycemia, immobility, mechanical ventilator, medication and history of chronic disease as modifiable contributing factors of the studied patients with muscle weakness and total medical research council scale for muscle strength. There was a statistically significant relation between age and gender as non-modifiable contributing factors of the studied patients with muscle weakness and total medical research council scale for muscle strength at p (0.03 & 0.01).

Table 1: Frequency and percentage distribution of the studied patients related to the personal characteristics (n=80).

| Personal characteristics	N	%
Age (years)		
• 20 < 30	4	5
• 30 < 40	6	7.5
• 40 < 50	12	15
• 50 ≤ 60	58	**72.5**
Mean($\overline{x}$) ± SD	**58.7±16.7**	
Gender		
• Male	33	41.3
• Female	47	**58.7**

Marital Status		
• Married	54	**67.5**
• Single	2	2.5
• Divorced	4	5
• Widow	20	25
Occupation		
• Working	30	37.5
• Not working	50	**62.5**
Educational level		
• Primary education	29	**36.2**
• Secondary education	12	15
• Diploma Education	28	35
• Bachelor's degree	9	11.3
• Postgraduate education	2	2.5

Table 2: Frequency and percentage distribution of the studied patients related to the current and past history (n=80).

Current history	N	%
Duration of current admission		
• 16 – 18days	55	**68.7**
• 19 – 21 days	22	27.5
• More than 21 days	3	3.8
Glasgow Coma Scale (GCS) on admission		
• Fully conscious	42	**52.5**
• Semi-conscious	23	28.7
• Unconscious	15	18.8
		Past-history
Previous ICU Admission		
• Yes	60	**75**
• No	20	25
Duration of previous ICU admission (n=60)		
• 1 – 3 days	15	25
• 4 – 6 days	8	13.3
• More than 7 days	37	**61.7**
History of chronic disease		
• Myocardial infarction	4	5
• Hypertension	48	**60**
• Diabetes Mellitus	12	15
• Renal	16	20
Duration of chronic disease		
• 1 – 3 years	12	15
• 4 – 6 years	7	8.8
• More than 7 years	61	**76.2**
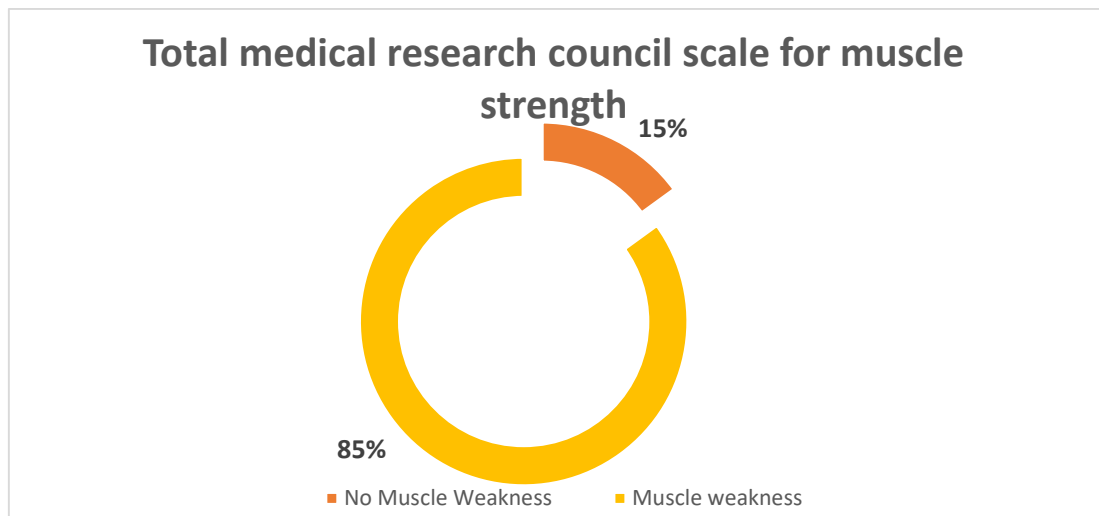
Figure 1: **Percentage distribution of the studied patients regarding the total medical research council scale for muscle strength (n=80).**

Table 3: Frequency, percentage distribution and incidence rate of the studied patients' modifiable and non-modifiable contributing factors for intensive care unit-acquired weakness (n=68).

Contributing factors		Muscle weakness		Incidence rate*
		N	%	
Modifiable Factors	**Hyperglycemia** ● Yes ● No	43 25	63.2 36.8	50%
	Connection with the mechanical ventilator ● Yes ● No **Duration of mechanical ventilator connection (n=23)** ● 1 – 3 days ● 4 – 6 days ● More than 7 days	23 45 21 1 1	33.8 66.2 91.4 4.3 4.3	52%
	Immobility ● Mobile ● Mobile with assistance ● Immobile	14 39 15	20.6 57.3 22.1	45%
	Nutrition ● Oral feeding ● Ryle feeding ● Parental feeding ● Gastrostomy feeding	40 26 2 0	58.8 38.2 3 0	47%
	Medication ● Vaso-active drugs ● Sedative drugs ● Corticosteroids ● Insulin therapy ● Neuromuscular blocking agent	33 6 14 15 0	48.5 8.8 20.6 22.1 0	38%
	History of chronic disease ● Myocardial infarction ● Hypertension ● Diabetes Mellitus ● Renal	3 45 8 12	4.4 66.2 11.8 17.6	52%

Contributing factors		Muscle weakness		Incidence rate*
		N	%	
Non-Modifiable Factors	Age ● 20 < 30 ● 30 < 40 ● 40 < 50 ● 50 ≤ 60	4 6 10 48	5.9 8.8 14.7 70.6	56%
	Gender ● Male ● Female	24 44	35.3 64.7	51%

* Incidence Rate = Total no. of new cases of disease / Total population at risk x Population size
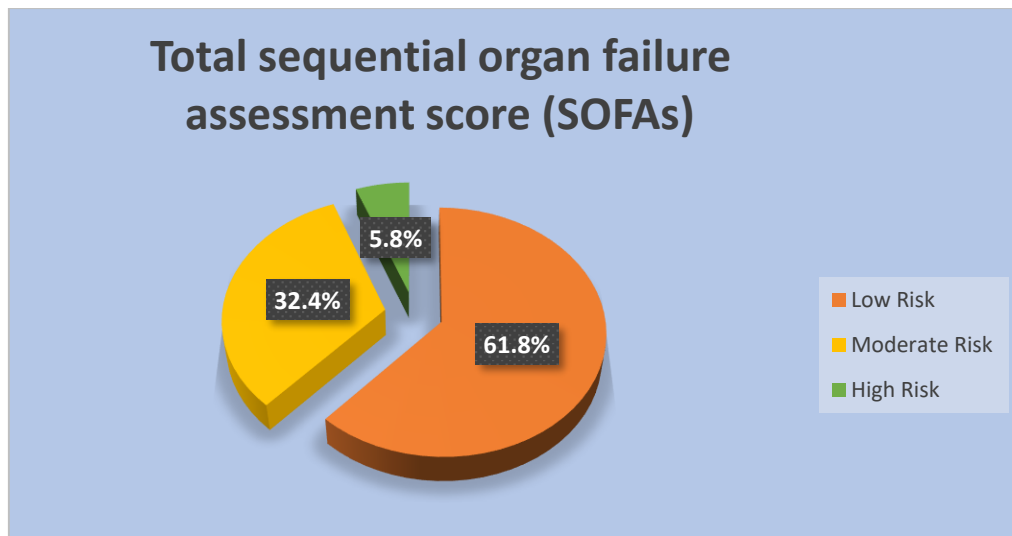

Figure 2: Percentage distribution of the studied patients with muscle weakness related to the total sequential organ failure assessment score (n=68).

Table (4) Relation between the Personal characteristics of the studied patients with muscle weakness and the total medical research council scale for muscle strength (n=68).

Personal characteristics	Total medical research council scale for muscle strength		Chi-square	P-Value
	Muscle Weakness (n=68)			
	N	%		
Age (years) ● 20 < 30 ● 30 < 40 ● 40 < 50 ● 50 ≤ 60	4 6 10 48	**5.9** 8.8 14.7 **70.6**	51.72	**0.03***
Gender ● Male ● Female	24 44	35.3 **64.7**	6.63	**0.01***
Marital Status ● Married ● Single ● Divorced ● Widow	42 2 4 20	**61.7** **2.9** 5.9 29.4	6.79	0.07
Occupation ● Working	24 44	35.3 **64.7**	0.941	0.332

• Not working				
Educational level				
• Primary education	28	**41.2**		
• Secondary education	5	7.3		
• Diploma Education	24	35.3	22.66	**0.000****
• Bachelor's degree	9	13.3		
• Postgraduate education	2	**2.9**		

* Significant P ≤ 0.05   **** Highly significant P ≤ 0.001**   **Not significant ≥ 0.05**

Table 5: Relation between the current and past history of the studied patients with muscle weakness and the total medical research council scale for muscle strength (n=68).

Current and past history	*Total medical research council scale for muscle strength*		*Chi-square*	*P-Value*
	Muscle Weakness (n=68)			
	N	*%*		
Duration of current admission				
• *16 – 18days*				
• *19 – 21 days*	*46*	*67.6*	*12.269*	*0.05**
• *More than 21 days*	*19*	*28*		
	3	*4.4*		
Glasgow Coma Scale (GCS) on admission				
• *Fully conscious*			*10.435*	*0.000***
• *Semi-conscious*	*34*	*50*		
• *Unconscious*	*23*	*33.8*		
	11	*16.2*		
Previous ICU admission				
• *Yes*			*0.186*	*0.911*
• *No*	*51*	*75*		
	17	*25*		
History of chronic disease				
• *Myocardial infarction*				
• *Hypertension*	*3*	*4.4*	*9.953*	*0.127*
• *Diabetes Mellitus*	*45*	*66.2*		
• *Renal*	*8*	*11.8*		
	12	*17.6*		
Duration of chronic disease				
• *1 – 3 years*	*8*	*11.8*	*21.84*	*0.05**
• *4 – 6 years*	*5*	*7.4*		
• *More than 7 years*	*55*	*80.8*		

* Significant P ≤ 0.05   **** Highly significant P ≤ 0.001**   **Not significant ≥ 0.0**

Table 6: Relation between the modifiable and non-modifiable contributing factors of the studied patients with muscle weakness and the total medical research council scale for muscle strength (n=68).

	Contributing factors	Total medical research council scale for muscle weakness		Significance test	P-Value
		N	**%**		
Modifiable factors	**Hyperglycemia** • Yes • No	43 25	**63.2** 36.8	0.753 (Chi-square)	0.386
	Connection with the mechanical ventilator • Yes • No	23 45	33.8 **66.2**	0.362 (Chi-square)	0.547
	Immobility • Mobile • Mobile with assistance • Immobile	14 39 15	20.6 **57.3** 22.1	1.096 (Anova Test)	0.578
	Nutrition • Oral feeding • Ryle feeding • Parental feeding • Gastrostomy feeding	40 26 2 0	**58.8** 38.2 3 **0**	7.602 (Anova Test)	**0.02***
	Medication • Vaso-active drugs • Sedative drugs • Corticosteroids • Insulin therapy • Neuromuscular blocking agent	33 6 14 15 0	**48.5** 8.8 20.6 22.1 0	4.830 (Anova Test)	0.305
	History of chronic disease • Myocardial infarction • Hypertension • Diabetes Mellitus • Renal	3 45 8 12	4.4 66.2 11.8 17.6	9.953	0.127
Non-modifiable factors	**Age (years)** • 20 < 30 • 30 < 40 • 40 < 50 • 50 ≤ 60	4 6 10 48	**5.9** 8.8 14.7 **70.6**	51.72	**0.03***
	Gender • Male • Female	24 44	35.3 **64.7**	6.63	**0.01***

* Significant P ≤ 0.05   **** Highly significant P ≤ 0.001**   **Not significant ≥ 0.**

Discussion:

According to age, the present study showed that more than two thirds of the studied patients were in the age from 50-60 years. This result is agreement with **Mostafa (2023)** who applied their study in Menoufia in

entitled with " risk factors for acquired muscle weakness among critically all patients" and showed that majority of patients were old age ≥50 years.

Considering gender, the present study revealed that more than half of the studied patients were females; This result is congruent with **Vanhorebeek etal (2020)** who applied their study in Germany entitled with " ICU-acquired weakness " and showed that the higher risk of weakness may apply to women than to men and this result agreement with **Elsaman etal (2022)** entitled with "Correlation between Intensive Care Unit Acquired Weakness and Hyperglycemia in Critically Ill Geriatric Patients" and showed that more than half of the studied patients were females. **In other hand,** this result disagreement with **Mostafa (2023)** showed that more than half of the studied patients were males.

As regarding marital status, this study showed that about two thirds of the studied patients were married. from the investigator point of view this may be due to more than two thirds of the studied patients were in the age from 50-60 years; this result was incongruent with **Yang etal (2022)** who applied their study in China entitle as " Analysis of the correlation between the longitudinal trajectory of SOFA scores and prognosis in patients with sepsis at 72 hours after admission based on group trajectory modeling" and showed less than half of the studied patients were married.

The current study found that, more than half of the studied patients were not working. From the investigator point of view this result may be due to more than half of the studied patients were females and more than one third of the studied patients were in primary education; This result is disagreement with **Mostafa (2023)** and showed that about one third of them were housewives.

Regarding the educational level, this study found that more than one third of the studied patients were in primary education; This result is incongruent with **Zhou etal (2022)** entitled as "Effect of early mobilization combined with early nutrition on acquired weakness in critically ill patients (EMAS): A dual center, randomized controlled trial" who showed that more than two fifths of the studied patients were illiterate.

As regarding to duration of current admission, the present result found that more than two thirds of the studied patients were admitted to ICU for duration of 16-18 days and minority of them were admitted to ICU a duration more than 21 days; this result incongruent with **Nazir & Anggraini (2024)** entitled as " Rehabilitation management of intensive care unit-acquired weakness (ICU-AW): A narrative review" showed that less than one quarter to more than half of the studied patients were admitted duration from 7-10 days.

According to glasgow coma score on admission, in the present study it showed that less than one fifth of the studied patients were unconscious patients. From the investigator's point of view this result was due to that less than one third of the studied patients were connected with mechanical ventilation. This result disagrees with **Hatchimonji et al. (2020)** in the titled " Questioning dogma: does a GCS of 8 require intubation?" showed that more than half of the study were unconscious patients.

Concerning pervious ICU admission, the present study finding showed that the majority of the studied patients had history of pervious ICU admission and more than half of them had pervious ICU admission for more than 7 days. From the investigator point of view this result may be due to that more than half of the studied patients had chronic disease that liable them for ICU admission; this study agrees with **Gholi et al. (2024)** who applied

their study in Italy entitled with "Malnutrition elevates delirium and ICU stay among critically ill older adult COVID-19 patients" who showed that more than half of the studied patients had pervious ICU admission more than 7 days.

According to the history of chronic disease, the present study results showed that more than half of the studied patients had chronic disease and majority of them lived with chronic disease for more than 7 years. From the investigator point of view, this might be due to more than two thirds of the studied patients were in the age from 50-60 years and this age liable them for chronic diseases; this result was inconsistent with **Antonela et al. (2020)** who applied their study in America entitled with " Epidemiological characteristics and risk factors of adult patients with intensive care unit-acquired weakness" and showed that more than one third of studied patients had hypertension.

As regards critically ill patients diagnosis, the present study showed that more than one third of the studied patients had cardiovascular problems and minority of them had renal problems. From the investigator point of view, this might due to more than two thirds of the studied patients their age from 50-60 years and this age liable them for risk for cardiovascular problems; this study goes in line with **Watanabe et al. (2023)** entitled as "association between intensive care unit acquired weakness and early nutrition and rehabilitation intensity in mechanically ventilated patients: a multicenter retrospective observational study" who showed that more than one third of the studied patients had cardiovascular disease and also agrees with **Wang & Long (2024)** who applied their study in Austria entitled as " Significant risk factors for intensive care unit-acquired weakness: A processing strategy based on repeated machine learning" who showed that minority of the studied patient had acute kidney injury.

Regarding medical research council scale, the present study found that majority of the studied patients had muscle weakness. From the investigator point of view, it is probably due to more than two thirds of the studied patients were in the aged from 50<60 years. In addition that more than half of them had hyperglycemia, as less than one third of them were connected with mechanical ventilation and were immobile, while less than half of them were received vaso-active drugs and taking ryle feeding and all those were contributing factors for ICU-AW; this study agrees with **Fontela et al. (2021)** entitle as " Medical research council scale predicts spontaneous breathing trial failure and difficult or prolonged weaning of critically ill individuals" who showed that majority of the studied patients had muscle weakness.

Considering hyperglycemia as modifiable contributing factors, the present study results showed that more than half of the studied patients had hyperglycemia with muscle weakness. From the investigator point of view, this prove that hyperglycemia is contributing factor for ICU-AW; this study disagrees with **Elsaman et al. (2022)** who conducted their study in Egypt entitled " Correlation between intensive care unit acquired weakness and hyperglycemia in critically ill geriatric patients" which showed that one third of the studied patients had hyperglycemia and ICUAW.

According to connection with mechanical ventilation and its duration as modifiable contributing factors, the present study found that less than one third of the studied patients with muscle weakness connected to mechanical ventilation and most of them remained connected for 1:3 days. From the investigator point of view this result may be that less than one fifth of the studied patients were unconscious; This study agreement with

Cheon (2023) as titled "Evaluating the prognostic efficacy of scoring systems in neurocritical and neurosurgical care: An insight into APACHE II, SOFA, and GCS" which showed less than one third of the studied patients were connected with mechanical ventilation.

In other hand, this result disagreed with **Yang et al. (2022)** who applied their study in China entitled with " A systematic review and meta-analysis of risk factors for intensive care unit acquired weakness" and showed majority of the studied patients were connected with mechanical ventilation.

According to immobility as modifiable contributing factors, the present study showed that more than half of the studied patients with muscle weakness were mobile with assistance. From the investigator point of view this result is probably due to more than half of the studied patients were fully conscious; this study agrees with **Mostafa (2023)** who showed that more than half of the studied patients needed to wheelchair and assistance.

According to nutrition as modifiable contributing factors, the present result showed that more than half of the studied patients were able to take oral feeding. From the investigator point of view this result possibly due to more than half of the studied patients were mobile with assistance and fully conscious; this result is like **Mostafa (2023)** who showed that more than half of the studied patients able to take oral feeding.

According to medications as modifiable contributing factors, the present results finding demonstrated that more than two fifths of the studied patients with muscle weakness had receive vaso-active drugs. From the investigator point of view this may be due to less than one third of the studied patients were connected with mechanical ventilation; this result congruent with **Zhang et al. (2024)** conduct a study in China about "Effects of the high-intensity early mobilization on long-term functional status of patients with mechanical ventilation in the intensive care unit" who showed that more than two fifths of the studied patients had received vaso-active drugs. **In other hand** these study result disagrees with **Liu etal (2024)** conduct a study in China about "Risk factors for ICU-acquired weakness in sepsis patients: A retrospective study of 264 patients" who showed that the majority of the studied patients had received vaso-active drugs.

As regarding the relation between personal characteristics of the studied patients and the total medical research council scale for muscle strength, the present study revealed there was a high statistically significant relation between educational level of the studied patients and the total medical research council scale for muscle strength, while the relation between age and gender and the total medical research council scale for muscle strength were a statistically significant, also there weren't statistically significant relation between patients' occupation and marital status and the total medical research council scale for muscle strength. This proves that old age and female patients are risk factors for ICU-AW; this result agrees with **Antonela et al. (2020)** who showed the relation between female gender and ICU-AW was statistically significant.

According to relation between the current and past history of the studied patients and the total medical research council scale for muscles strength, the present study revealed there were a high statistically significant relation between the glasgow coma scale of the studied patients on admission and the total medical research council scale for muscles strength, addition to there was statistically significant relation between the duration of current admission and duration of chronic disease and the total medical research council scale for muscle strength, while there weren't statistically significant relation between the pervious ICU admission and history of chronic disease and the total medical research council scale for muscle strength of the studied patients,

this result agrees with **Yang et al. (2022)** who showed that there was statistically significant relation between length of ICU stay and ICU-AW.

Concerning relation between the modifiable and non-modifiable contributing factors of the studied patients with muscle weakness and the total medical research council scale for muscle strength, the present result found that there were a statistically significant relation between nutrition as modifiable contributing factors and the total medical research council scale for muscle strength, while weren't a statistically significant relation between hyperglycemia, medication, mechanical ventilation and immobility as modifiable contributing factors and the total medical research council scale for muscle strength. From the investigator point of view this result proves this nutrition is contributing factors for ICU-AW; this result was inconsistent with **Elsaman et al. (2022)** who showed there were high statistically significant relation between muscle weakness and hyperglycemia. in addition to the preset study demonstrated that there was no statistically significant relation between drugs and muscle weakness. Also, this result disagrees with **Mostafa (2023)** who showed that there was a high statistically significant relation between incidence of ICU-AW and using corticosteroid.

Conclusion:

The current study clarified that majority of the studied patients had muscle weakness while a minority of them had no muscle weakness. The major contributing factors of intensive care unit acquired weakness were hyperglycemia, connected with mechanical ventilation, immobility, nutrition, medications and history of chronic diseases as modifiable contributing factors. While age and gender as non-modifiable contributing factors.

There was a statistically significant relation between nutrition as modifiable contributing factors of the studied patients and the total medical research council scale for muscle strength. While there was a statistically significant relation between age and gender as non-modifiable contributing factors and the total medical research council scale for muscle strength.

Recommendations:

➢ Using the medical research council scale to diagnose ICUAW should being a routine physical examination in all hospitals.
➢ Early mobilization protocols should be done for critically ill patients and apply range of motions exercise to prevent ICU-AW.
➢ Applying a nursing care strategies to decrease the effect of immobility and mechanical ventilation on the incidence of muscle weakness.

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