Factors Contributing to Acquired Muscle Weakness Among Critical Ill Patients

Thesis

Submitted for Partial Fulfillment of Master Degree in Nursing Science ***(Critical Care Nursing)***

By

Mona Abd Elaty Atea Mohamed

Demonstrator of Medical Surgical Nursing

Faculty of Nursing

Beni-sueif University

Faculty of Nursing
Ain Shams University
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Supervised By

Prof. Dr. / Manal Salah Hassan

Professor of Medical Surgical Nursing

Faculty of Nursing Ain-Shams University

Dr/ Zeinab Hussein Bakr

Lecturer of Medical Surgical Nursing

Faculty of Nursing Ain- Shams University

Dr/ Eman Fathy Amr

Lecturer of Medical Surgical Nursing

Faculty of Nursing-Beni-Suef University

Faculty of Nursing

Ain Shams University

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Candidate

Mona Abdelaty Atea

Abstract

Intensive Care Unit Acquired Muscle Weakness (ICU-AW) is one of the most important complications occurs in the ICU. It is a multifactorial syndrome characterized by generalized muscle weakness. Critical Care Nurses (CCNs) have an important role in the prevention of ICU-AW through increase mobility and applying of range of motion (ROM) exercise. **Aim:** This study aimed to assess factors contributing to acquired muscle weakness among critical ill patients**. Design:** A descriptive explorative design was utilized for the conduction of this study. **Setting**: the study was carried out in intensive care units (ICUs) of Beni–Suef University Hospital (general, chest and internal medicine ICU). **Study subject: A** Purposive sample of seventy five patients admitted to the previous mentioned setting. **Tools of data collection were consisted of** patient assessment tool, muscle strength scale /medical research council (MRC) and indicators to incidence of ICU-AW, and factors contributing to ICU-AW assessment tool**. Results:** revealed that, more than half of studied patients had ICU-AW, the majority of studied patients who had muscle weakness were older than the Non ICU-AW patients. Application of positioning and range of motion exercises were not done in the ICU-AW patients. Administration of corticosteroid and incidence of malnutrition was higher in the ICU-AW patients than the Non ICU-AW patients. There were no statistically significant relation between incidence of ICU-AW and gender, admission medical diagnosis, administration of parenteral nutrition and application of positioning, and walking exercises. **Conclusion:** More than half of studied patients developed ICU-AW. The contributing factors of ICU-AW are patient age, WBCs level, no applying range of motion and chair sitting exercise to ICU patients, administration of corticosteroid and malnutrition. **Recommendations:** Further research is recommended to study extensively the effect of nutritional status on incidence of ICU-AW. Also, examine the incidence of ICU-AW in sedated and unconscious patients.

Keywords: Intensive Care Unit, Acquired Muscle Weakness, Critical Care Unit.

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List of Abbreviations

Abb.	*Full Term.*
ADLs	**:** Activities of Daily Living
ARDS	**:** Acute Respiratory Distress Syndrome
AROM	**:** Active Range of Motion
ATP	**:** Adenosine Triphosphate
BEE	**:** Basal Energy Expenditure
BMD	**:** Bone Mass Density
BMI	**:** Body Mass Index
CAI	**:** Catheter Associated Infections
CCNs	**:** Critical Care Nurses
CIM	**:** Critical Illness Myopathy
CINM	**:** Critical Illness Neuromyopathy
CIP	**:** Critical Illness Polyneuropathy
CIPNM	**:** Critical Illness Polyneuromyopathy
CK	**:** Creatine Kinase
CM	**:** Centimeter
CMAP	**:** Compound Muscle Action Potential
COPD	**:** Chronic Obstructive Pulmonary Disease
DNA	**:** Deoxyribonucleic Acid
DVT	**:** Deep Venous Thrombosis
EMG	**:** Electromyography
EMS	**:** Electrical Muscle Stimulation
EN	**:** Enteral Nutrition
EPS	**:** Electrophysiological Study

ESR : Erythrocyte Sedimentation Rate
GABA : γ-Amino Butyric Acid
Hrs : Hours
HS : Highly Significant
ICU : Intensive Care Unit
ICUAP : Intensive Care Unit Acquired Paresis
ICU-AW : Intensive Care Unit Acquired Weakness
IGF-1 : Insulin like Growth Factor 1
IV : Intravenous
Kcal : Kilocalorie
Kg : Kilogram
KSA : Kingdom of Saudi Arabia
LOS : Length of Stay
M : Minute
ML : Millimeter
MOF : Multiple Organ Failure
MRC : Medical Research Council
mTOR : Mammalian Target of Rapamycin
N : Number
NCS : Nerve Conduction Studies
NMBAs : Neuromuscular Blocking Agents
NMDA : N-Methyl-D-Aspartate receptors
NR : Nutritional Requirements
NS : No Significance
PCV : Pressure Controlled Ventilation

PICS : Post Intensive Care Syndrome
PMV : Pressure Mechanical Ventilator
PROM : Passive Range of Motion
RBCs : Red blood cells
ROM : Range of Motion
S : Significant
SaO2 : Saturation of Oxygen
SD : Standard Deviation
SIRS : Systemic Inflammatory Response Syndrome
SRMD : Stress Related Mucosal Disease
UK : United Kingdom
UPS : Ubiquitin Proteasome System
USA : United State of America
VAP : Ventilator Associated Pneumonia
V/S : Vital Signs
VTD : Venous Thromboembolic Disease
WBCs : White Blood Cells
WOCN : Wound, Ostomy & Continence Nurses

Introduction

Intensive Care Unit Acquired Muscle Weakness (ICU-AW) is one detrimental effect of critical illness on physical function. This term refers to a wide variety of disorders characterized by acute onset of neuromuscular impairment for which there is no other plausible cause than the critical illness. It is characterized by bilateral symmetrical flaccid weakness of the limbs, facial and ocular muscles are often spared, and deep tendon reflexes are usually reduced ***(Castro, Seron, Fan, Gaete & Mickan, 2015).***

Intensive care unit (ICU) patients has identified with generalized muscle weakness and represent about 70 -80 % of admitted patients. There are different terminology used to define this generalized weakness, a critical illness associated polyneuropathy, myopathy and neuromyopathy have broadly been identified. These syndromes are now all included under the clinical diagnostic label of ICU-AW ***(Appleton, Kinsella & Quasim, 2015).***

The reported incidence of ICU-AW varies depending on the patient, timing of assessment and diagnostic methods used. ICU-AW is common and range from 26 - 65% for patients intubated for a duration of 5-7 days, and

up to 67% of patients with prolonged periods of intubation (>10 days) ***(Wieske et al., 2015)***.

Intensive Care Unit Acquired Muscle Weakness (ICU-AW) persisted for at least another 7 days following extubation in an estimated 25% of those ICU patients. In patients with acute respiratory distress syndrome (ARDS), an estimated 60% of them develop ICU-AW. The incidence of ICU-AW is significantly higher in individuals with sepsis and has been reported to be as high as 50 –100 % ***(Nakamura & Yonclas, 2017).***

Intensive Care Unit Acquired Muscle Weakness (ICU-AW) is classified to critical illness polyneuropathy (CIP), critical illness myopathy (CIM), or both. CIP refers to diffuse and symmetric sensorimotor axonal neuropathy and observe a distal loss of sensitivity to pain, vibration, and temperature, and often the patients have difficult to breathe spontaneously or to be weaned from mechanical ventilation due to phrenic nerve and diaphragm involvement ***(McWilliams, Weblin & Atikns, 2015)***.

Critical illness myopathy (CIM) occurs more frequently than CIP and patients characteristics include early loss of muscle tissue, but with conservation or slightly reduced deep tendon reflexes. In critical illness