

# 8. POST-INTENSIVE CARE DEPRESSION FOLLOWING CRITICAL ILLNESS IN PATIENTS AFTER USING MECHANICAL VENTILATION

*By Faizatuz Azzahrah Syamsudi*

**Original Research Article: Quantitative Research**

**POST-INTENSIVE CARE DEPRESSION FOLLOWING CRITICAL ILLNESS IN PATIENTS AFTER USING MECHANICAL VENTILATION**

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**Abstract**

**Background:** Critical illness survivors have been improved due to advances in critical medicine, but they can experience psychological impairments after ICU discharge. Depression is one of the psychological impairments in Post-Intensive Care Syndrome (PICS). Post-Intensive Care Syndrome is a collection of symptoms that occur post-ICU discharge. This can be experienced by post-intensive care patient after using mechanical ventilation. Post-intensive care depression has an impact on the patient quality of life after ICU discharge.

**Objectives:** This study aimed to determine post-intensive care depression in patients after using mechanical ventilation and to investigate correlation duration of mechanical ventilation and ICU length of stay with post-intensive care depression.

**Methods:** This study was an observational analytic study with a cross-sectional design and retrospective medical record. We used total sampling technique. We enrolled all post-intensive care patient after using mechanical ventilation at Gedung Bedah Pusat Terpadu Dr. Soetomo General Hospital in a range of January-December 2020. The number of samples in this study was 97 Patients. We collect detailed sociodemographic data and clinical data from medical record. The symptoms of post-intensive care depression were assessed at least 3 months after ICU discharge with Beck Depression Inventory-II (BDI-II). The data were analyzed using Chi-Square statistical test.

**Results:** Out of 97 post-intensive care patients after using mechanical ventilation, 43 patients fulfilled the inclusion criteria and 27.91% among them had mild depression (BDI-II score = 14-19). There is no significant correlation between post-intensive care depression and duration of mechanical ventilation (value = 0.398) and there is no significant correlation between post-intensive care depression and ICU length of stay (p-value = 0.303).

**Conclusion:** Post-intensive care patients after using mechanical ventilation are prone to have mild depression at least three months after ICU discharge. However, there is no significant correlation duration of mechanical ventilation and ICU length of stay with post-intensive care depression.

**Keywords:** Intensive Care, Depression, Critical illness, Post-Intensive Care Syndrome, Mechanical Ventilation.

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## INTRODUCTION

Intensive care medicine involves the treatment performed for patients with critical illness and life-threatening conditions in the Intensive Care Unit (ICU). Due to advances in critical care medicine have led to an increase in patient survival after critical and life-threatening conditions (Needham et al., 2012). Critical illness is associated with long-term sequelae after ICU discharge. These sequelae include cognitive, physical, and psychological impairments. These impairments collectively referred to Post Intensive Care Syndrome (PICS). Depression, Post Traumatic Stress Disorder (PTSD), and anxiety disorders are related symptoms of psychological impairments in PICS (Rawal, Yadav, & Kumar, 2017).

The previous study reported that post-intensive care depression was to be five times more common than PTSD (Jackson et al., 2014). Post-intensive care depression has a negative impact on quality of life because of these sequelae can persist up to five years after ICU discharge (Cuthbertson et al., 2010). Post-intensive care depression has various risk factors including patient demographics (age and gender) and intensive care factors in the ICU. One of the risk factor is related to post-intensive care depression is the use of mechanical ventilation (Davydow et al., 2008 & Davydow et al., 2009).

Mechanical ventilation is a invasive procedures that performed during treatment in the ICU and helps the respiratory system to maintain the patient's life. The mechanical ventilation shows a high severity of illness (Pham, Brochard, & Slutsky, 2017). The severity of illness, illness perceptions, stress response, and depression have a relationship with each other. Patients that use mechanical ventilation with high severity of disease can produce negative illness perceptions. Negative

illness perceptions cause a high stress response and related on depression (Zhang et al., 2016).

Moreover, the use of mechanical ventilation can trigger pain due to treatments such as suction procedures. Pain caused by the use of mechanical ventilation has an influence on the stress response during treatment in the ICU (Sessler & Wilhelm, 2008). Experiences during treatment in the ICU make patients suffer, feel helpless, sad, feel punished, and can trigger the risk of developing depression after ICU discharge (Liao et al., 2020). Accordingly, post-intensive care depression following critical illness in patients after using mechanical ventilation need to be known because it is important to determine and develop effective interventions for patients.

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## METHODS

### Study Design

This study was an observational analytic study with a cross-sectional design and retrospective medical record.

### Setting

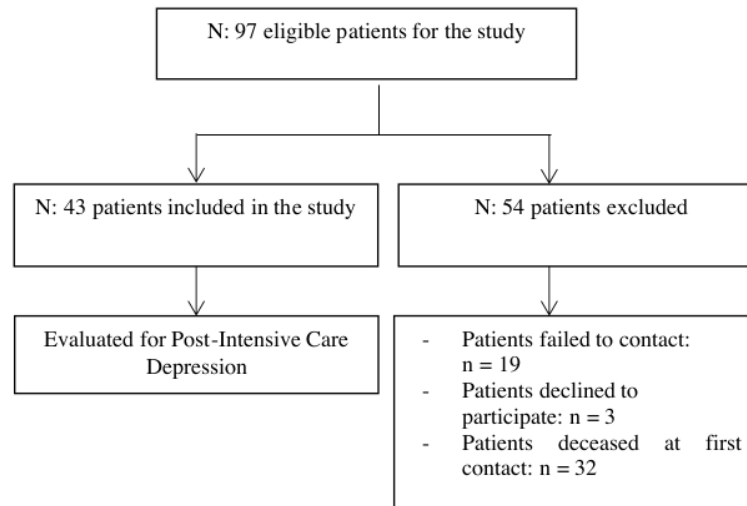
The study was conducted in the Gedung Bedah Pusat Terpadu Dr. Soetomo General Hospital in a range of November 2020 until May 2021.

### Research Subject

We enrolled all post-intensive care patient after using mechanical ventilation at Gedung Bedah Pusat Terpadu Dr. Soetomo General Hospital in a range of January-December 2020. Patients  $\geq 18$ -65 years old, minimal 3 months after ICU discharge, and after using mechanical ventilation in ICU were eligible for inclusion. Patients were excluded if they were failed to contact, deceased at first contact, declined to participate, and incomplete medical records. In case of a non-response, patients were re-contacted twice.

Patients were screened for eligibility between November-December 2020 and the start of data collection was set on December 2020 – May 2021. Calculating back from this time point, patients were retrospectively classified into 5 different groups: 3-12 months and >12 months after discharge from the ICU, respectively. Before the start of data

collection, survival status was checked in the hospital's patient information system (medical record). Eligible patients for inclusion were contacted by telephone before ask information for consent, informed consent and filling the questionnaire. They were asked about their preference to meet with researcher for informed consent, receive, and filling questionnaire.



**Figure 1.** Flow Diagram of This Study.

**Instruments**

Retrospective data were collected from the patient's medical record. Sociodemographic data include age, gender, and clinical data (duration of mechanical ventilation and ICU length of stay). The symptoms post-intensive care depression was measured at least 3 months after ICU discharge using the Beck Depression Inventory-II (BDI-II). BDI-II consists of 21 items representing symptoms of depression, which were scored on a 4-point Likert scale ranging from 0 through 3. By combining 21 items, the total BDI-II score can be calculated, ranging from 0 through 63, with cut-off point of >13 (Beck et al., 1961 & Beck, Steer, & Carbin, 1988).

**Data Analysis**

The collected data were stored using Microsoft® Excel® software and Statistical Program for Social Sciences (SPSS) v16.0 were

used for data analysis. Categorical variables were presented as frequencies and percentage. Bivariate correlations were evaluated using a Chi-Square test. A P value ≤0.05 was considered statistically significant.

**Ethical Consideration**

This study has received permission from the Ethics Committee of Dr. Soetomo General Hospital approved this study (0107/KEPK/XII/2020). This research was carried out by applying research ethics, which included autonomy (respect human), anonymity, informed consent, confidentiality, beneficence, and non- maleficence.

**RESULTS**

This research included 97 eligible patients for the study and 54 patients was excluded (see Fig.1). Based on the final analysis results, 43 patients were selected after fulfilling the

inclusion criteria. Demographic and Clinical Characteristics data of Patients are reported in Table 1. Table 1 showed that the patient's age is dominated by >50 years (27.90%); gender is dominated by men (62.79%); duration of mechanical ventilation was dominated by < 5 days (65.12%); and ICU length of stay was dominated by < 5 days (62.8%). The results of measuring patient outcomes after using mechanical ventilation in the ICU using the Beck Depression Inventory-II (BDI-II) questionnaire showed that patients (n=43) who had used mechanical ventilation were at risk for depression. The categories of depression levels

in the study respondents are shown in table 2. Based on table 2, there are 27.91% of patients after using mechanical ventilation experienced mild depression after leaving the ICU (BDI-II score of mild depression = 14-19). Table 3 shows the average duration of mechanical ventilation in the ICU is 4.4 days and the average duration of mechanical ventilation in patients with post-intensive care depression is 3.2 days. Meanwhile, the average ICU length of stay is 5.8 days and the average ICU length of stay for patients with post-intensive care depression is 3.6 days.

**Table 1.** Demographic and Clinical Characteristics Data of Patients at the Gedung Bedah Pusat Terpadu Dr. Soetomo General Hospital in a range of November 2020 until May 2021 (n = 43).

Characteristics	Frequency	Percentage (%)
Age		
< 21 years	3	6.98
21 - 30 years	10	23.26
31 - 40 years	8	18.60
41 - 50 years	10	23.26
> 50 years	12	27.90
Gender		
Male	27	62.79
Female	16	37.21
Duration of mechanical ventilation		
< 5 days	28	65.12
≥ 5 days	15	34.88
ICU Length of Stay		
< 5 days	27	62.79
≥ 5 days	16	37.21

Sources: Medical Record, 2020.

**Table 2.** Category of Post-Intensive Care Depression in Patients After using Mechanical Ventilation at the Gedung Bedah Pusat Terpadu Dr. Soetomo General Hospital in a range of November 2020 until May 2021 (n = 43).

Depression category (BDI-II Score)	Frequency (f)	Percentage (%)
No Dep. (0-13)	31	72.09
Mild Dep. (14-19)	12	27.91
Moderate Dep. (20-28)	0	0
Severe Dep. (29-63)	0	0

Sources: BDI-II Questionnaire, 2020.

**Table 3.** Clinical Data of the Mean Duration of Mechanical Ventilation and ICU Length of Stay at the Gedung Bedah Pusat Terpadu Dr. Soetomo General Hospital in a range of November 2020 until May 2021 (n = 43).

Variable	Total n = 43	No Post-intensive Care Depression n = 31	With Post-intensive Care Depression n = 12
Duration of MV*, days, mean ± SD	4.4 ± 4.6	4.9 ± 5.2	3.2 ± 2.0
ICU Length of Stay, days, mean ± SD	5.8 ± 6.5	6.6 ± 7.2	3.6 ± 2.9

\* MV = Mechanical Ventilation.

**Table 4.** The Correlation Between Post-Intensive Care Depression and Onset of Outcome Data Collection After ICU Discharge using Chi-Square Test.

Depression	Onset of Data Gathering After ICU Discharge		p-value
	3 - 12 Months	> 12 Months	
Yes	12 (27.9%)	0 (0%)	0.036*
No	22 (51.2%)	9 (20.9%)	

\* Chi-Square Test.

Table 4 showed that the results of the Chi-Square test showed a statistically significant correlation between post-intensive depression and the onset of outcome data collection after discharge from the ICU with  $p=0.036$  ( $p \leq 0.05$ ).

In terms of onset of outcome data collection

after discharge from the ICU, they were classified into two different groups, 3-12 months and 12 months. A total of 12 patients with depression were collected for data at 3-12 months.

**Table 5.** The Correlation between Post-Intensive Care Depression and Duration of Mechanical Ventilation using Chi-Square Test.

Depression	Duration of MV*		p-value
	< 5 days	≥ 5 days	
Yes	9 (32.1%)	3 (20%)	0.398**
No	19 (67.9%)	12 (80%)	

\* MV = Mechanical Ventilation; \*\* Chi-Square Test.

**Table 6.** The Correlation between Post-Intensive Care Depression and ICU Length of Stay using Chi-Square Test.

Depression	ICU Length of Stay		p-value
	< 5 days	≥ 5 days	
Yes	9 (33.3%)	3 (18.7%)	0.303*
No	18 (66.7%)	13 (81.3%)	

\* Chi-Square Test.



Table 5 showed that the results of the Chi-Square test there is no statistically significant correlation between post-intensive care depression and the duration of mechanical ventilation with  $p$ -value = 0.398 ( $\alpha > 0.05$ ). In the Table 6 showed that the results of the Chi-Square test, there is no significant correlation between post-intensive care depression and ICU length of stay with  $p$ -value = 0.303 ( $\alpha > 0.05$ ).

## DISCUSSION

Post-intensive care depression is one of the symptoms of Post Intensive Care Syndrome (PICS) (Rawal et al., 2017). The prevalence of post-intensive care depression in this study is similar to a study conducted by Davydow et al., (2009). Thus, the results of this study indicate that the prevalence of depression within a minimum of 3 months post-ICU discharge in critically ill patients and after using mechanical ventilation is quite high and at risk of depression after ICU discharge. Post-intensive care depression as much as 27.9% was included in the category of mild depression with a BII-II score: 14-19. This result was supported by Jackson et al., (2014), that mild depression was found to be due to reduced depression symptoms within 12 months after ICU discharge. The reduction of depression symptoms is maybe influence by onset of outcome data collection after ICU discharge in this recent study. The onset of outcome data collection after ICU discharge in this study were retrospectively classified into two different groups: 3-12 months and >12 months. Total of 27.91% patients who experiencing post-intensive care depression were collected in the 3-12-month group, but in the 12-months group, there were no patients who experienced post-intensive care depression. In this study showed a significant correlation between post-intensive care depression and the onset of outcome data collection after discharge from the ICU ( $p=0.036$ ). Therefore, depression can occur after discharge from the ICU. Although the symptoms of depression may decrease with along the time after ICU discharge.

Several studies have been conducted discussing the mechanisms that may be associated with post-intensive care depression, the inflammatory reactions and the imbalance of neurotransmitter (Davydow et al., 2008). Both of these mechanisms maybe related to the stress response of patients during intensive care. Intensive care is required for critically ill patients, but this intensive care has a psychological impact due to exposure to the ICU environment. The ICU environment has a high noise levels, absence of normal day-night cycles, disturbed sleep cycles, inability of intubated patients to speak, pain or tenderness triggered by several medical procedures related to organ support such as the use of mechanical ventilators, and other treatment factors in the ICU. This experience makes patients more suffer, feel helpless, sad, feel punished, and can trigger of post-intensive care depression (Liao et al., 2020). Therefore, post-intensive care depression was related to patient's critical condition and risk factors of treatment in the ICU. It is important to know the risk factors of post-intensive care depression.

In the current study, we investigated two risk factors for post-intensive care depression that is duration of mechanical ventilation and ICU length of stay. The analysis results in this study showed that there was no statistically significant correlation between post-intensive care depression and duration of mechanical ventilation test ( $p=0.398$ ) and there was also no significant correlation between post-intensive care depression and ICU length of stay ( $p=0.303$ ). This result was similar to a study conducted by Vlase et al., (2020) and Battle, James & Temblett, (2015). In contrast to the study conducted by Nelson et al., (2000), found a significant correlation between post-intensive care depression and duration of mechanical ventilation ( $p=0.013$ ); and significant correlation between post-intensive care depression and ICU length of stay ( $p=0.07$ ).

These results are different from this current study. It was influenced by first, the differences in the mean duration of mechanical ventilation and ICU length of stay. The mean

duration of mechanical ventilation and ICU length of stay in this study is 4.4 and 5.8 days, while research conducted by Nelson et al. (15) reported 43 and 27 days. Second, the differences in the onset of outcome data collection. This study was started at least 3 months after ICU discharge, while research<sup>46</sup> conducted by Nelson et al. (15) was started at 6 months after ICU discharge.

Although this study did not show a significant correlation between duration of mechanical ventilation and ICU length of stay with post-intensive care depression. Patient's post-intensive care has various other potential risk factors caused by critical ill conditions and may correlate with post-intensive care depression. Furthermore, it is need of further study. The other potential risk factors could be investigated and it would be important to determine and develop effective interventions for critical illness survivors.

## CONCLUSION

In conclusion, post-intensive care patients after using mechanical ventilation are prone to have mild depression at least three months after ICU discharge. However, there is no significant correlation duration of mechanical ventilation and ICU length of stay with post-intensive care depression.

This study had several limitations. First, the study focused on post-intensive care patients after using mechanical ventilation. The results of this study may not generalize to post-intensive care patient population, but the comparison of the results of this study with previous studies shows the same consistent results, so, that it can support the generalization of the results of the study.

Second, this study experienced limitations on the variables data collected. This limitation can eliminate variables that are potential risk factors for post-intensive care depression, such as severity of illness, and other ICU clinical factors (use of sedative drugs, use of opioids, daily pain assessment, sedation and delirium). The addition of research variables was recommended to determine other potential risk

factors that correlate with post-intensive care depression in future studies.

Third, the research design uses an observational study. This study can not show a cause-and-effect relationship, but the results of the study are used as a risk marker for depression that can occur after ICU discharge.

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## DECLARATION OF CONFLICTING INTEREST

There is no conflict to occurred in this study.

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The funds used in this study are the researchers' personal funds.

## AUTHOR CONTRIBUTION

**Faizatuz Azzahrah Syamsudi:** Designed the study, collected and analyzed data, and contributes to the completion of the research and article

**Bambang Pujo Semedi:** Contributes to the completion of the research and article.

**Betty Agustina Tambunan:** Contributes to the completion of the research and article.

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# 8. POST-INTENSIVE CARE DEPRESSION FOLLOWING CRITICAL ILLNESS IN PATIENTS AFTER USING MECHANICAL VENTILATION

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