

# Evaluation of mortality rate among ICU patients in university hospitals of Tehran

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## **Abstract:**

**Objective:** *One of the challenging issues in the intensive care unit, in addition to controlling mortality, is the identification of effective factors in this area. Previous studies have found many causes, including diagnosis of disease, age, chronic health status and physiological indicators, in terms of mortality. However, there are disagreements about the causes of death. In this study, we have tried to investigate the causes and factors affecting mortality in Tehran hospitals.*

**Data Sources:** *In this cross-sectional and retrospective study, mortality rate and its risk factors were evaluated in intensive care units in university hospitals in Tehran.*

**Study Selection:** *This study was conducted in 2011-2015 years in 12857 patients. In this study age, sex, duration of hospitalization in ICU, cause of hospitalization, underlying disease, date of discharge or death, cause of death, type of ICU and APACHE score.*

**Data Extraction:** *The results of the study showed that the highest mortality rate was in men ( $p = 0.001$ ).*

*Data Synthesis* *there was a direct correlation between mortality rates and segments of closed ICU, duration of admission, cause of hospitalization, aphasis score of patients, while there was no significant relationship between age and mortality ( $P = 0.8$ )*

**Conclusions:** *The results of this study were consistent with many previous studies, but the mortality rate with the high level of the statistical society has been less frequent than previous studies. However, the need for study in different populations is needed to achieve better results.*

**Keywords:** *Deaths, Factor, Intensive Care Unit, Hospitalized Patients*

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## **I. INTRODUCTION:**

Critically ill patients, with the worst health conditions, has being treated in intensive care units (ICU) due to special facilities. Regarding to the several groups of patients in need of intensive care, in order to have a better treatment, assessing physiological condition and prioritizing them is very important (1).

It seems that the most accurate sign of the treatment quality in ICU wards, is the mortality rate (2). Thus, for the intensivists, finding effective factors on mortality rate will be important in order to improve the treatment and protocols (3,4).

In the past decades, different systems had been designed for assessing and categorizing the severity of diseases and the purpose of all these indicators is to make a better clinical situation for the patients (5-7). Also, several studies around the world had been published to report the mortality rate in different ICU wards and some confounding factors were introduced. In our country, several studies have been performed and published in different cities and centers to assess mortality rate and its affecting factors. However, there is no multicenter comprehensive study which assessed these variables in more than one center, as well as focusing on academic centers and university hospitals.

## **II. METHODOLOGY:**

This project, is a retrospective cross-sectional study that evaluate the mortality rate and related risk factors in the intensive care unit patients at university hospitals in Tehran.

During 2012 to 2015, all patients admitted to the intensive care units of university hospitals in Tehran for any reasons, were enrolled. This study only evaluated medical, surgical and general ICU wards and specialized units for obstetrician-gynecology, neurology, pediatrics, burn and pulmonary diseases, were excluded.

A personal questionnaire was assigned for each patient that contain personal information, as well as examining variables. Independent variables examined in this study included age, sex, length of stay in the intensive care unit, reason of admission, underlying disease, discharge or expiration date, cause of death, type of ICU and APACHE score.

The questionnaire provided regarding scientific articles and reference books, was assessed by experienced anesthesiology professors and its validity was approved after needed alterations. Also, its reliability was assessed by test / retest in 15 patients. The average consistency of the questionnaire was evaluated using the kappa coefficient and estimated to be 85% which is suitable for this study. Finally, Information obtained from the studied population, was entered in SPSS the 19<sup>th</sup> version for statistical analysis.

### III. RESULTS:

The total population of the study consisted of 12,857 patients, including 7310 males (%56/8) and 5547 females (%43/2). Of the total population, 10110 patients (%78/63) have been discharged and 2747 patients (%21/37) died. The relationship between gender and mortality rate in this population was statistically significant and mortality rate was higher in male patients. (P = 0/001)

Evaluating the effects of ICU type on the mortality rate, showed that the expiration is the highest in semi-closed wards (%45/4) and the lowest in closed ones (%21/6). The difference was statistically significant. (P=0/001)

The average age of the total population was  $54/42 \pm 20/44$ . Comparing different hospitals, the relation between mortality rate and age, was not statistically significant. (P = 0/8)

The average length of stay in the ICU was 20/55 days. Comparing hospitals according to the length of stay, in terms of patients' expiration or discharge, a significant difference was reported. (P = 0/001)

The most patients, were admitted to ICU (%30/8) after surgery. The least number of patients were admitted due to ENT problems (%0/1). The relationship between cause of admission in ICU and mortality rate, was statistically significant. (P = 0/001)

Most patients (%54/5) did not report any underlying diseases. Among others, hypertension (%10/9), followed by diabetes mellitus (%9/7) were reported as the most common underlying diseases. Rheumatologic problems (%0/1) were the lowest in population. The relationship between the mortality rate and underlying diseases was statistically significant. (P = 0/001)

The APACHE score was only assessed in Sina and Rasoul-Akram Hospitals. Expired patients In both centers had higher APACHE scores. According to the statistical analysis, the relationship between the APACHE scores and mortality rate is significant. (P = 0/001)

The most common causes of death have been reported to be Multi organ failure + sepsis (%30/2), respiratory disorders (%21/6), and cardiovascular problems (%18/6). The difference between various hospitals according to the cause of death was statistically significant. (P = 0/001)

### IV. DISCUSSION:

According to Siegel et al.'s study in Finland, (2) 341 patients entered the study, 184 (53.95%) were men and 157 (46.05%) were women with the average age of 61 years. The mortality of this population was 43.4%.

Due to the fact that presenting study was multicenter, the difference in patients' numbers between studies, is completely logical and acceptable. As university hospitals are under government's supervision and admission cost is

low, the patients' turnover is reasonable and the high number of hospitalized patients cannot be connected to the high incidence of causes like trauma, surgery, etc.

Also in the Sentruk et al.'s study, <sup>(4)</sup> the effective factors on mortality in thoracic ICU patients were studied and it shows that the mortality rate of male patients is more than female ones ( $p < 0.05$ ) which agrees with our study.

Kashefi et al. <sup>(8)</sup> studied the demographic characteristics of ICU patients and their effects on mortality rate. It was reported that the average age in expired patients was higher and the relation between age and mortality is significant. ( $p = 0.013$ ) In contrast, we reported that there is no significant relation between age and mortality rate.

Bikenbach <sup>(9)</sup> studied the relation between lengths of ICU stay with mortality. According to the results, the longer period of ICU stay and being under Mechanical ventilation, the higher mortality rate will be expected. The result of this study is in the same line with the current one. The reason of this increase in mortality rate can be justified with the probability of acquired hospital infections, sepsis and also Respiratory failure which makes the Ventilator winning process harder.

According to the Capuzzo et al., <sup>(3)</sup> it has been shown that the most common cause of admission in ICU, is surgery and then trauma. Although, unlike current study, there is no reports of a meaningful relation between the cause of hospitalization and mortality. ( $p > 0.5$ )

Fuchs et al. reported that hypertension is the most common undelying disease and cardiovascular problems are in the second place. Although the prevalence of hypertension in the study above is higher (30.7%), but both studies agree on hypertension as the most common comorbidity in the ICU patients.

The average APACHE score was reported 17/50 for discharged patients and 22/33 for expired ones in Heidari et al. article. <sup>(1)</sup> It has been shown that there is a significant relation between physiologic APACHE score and the mortality rate. However, for both expired and discharged patients, the reported score is higher than present study, final result in both studies are in the same line.

The result of the Bikenbach et al. <sup>(9)</sup> study is the same as current one and has shown that the most common cause of death is sepsis and then Respiratory failure. While Gall et al. <sup>(11)</sup> has reported the heart disorders as the main cause. The difference in this Variable can be originated from the variety and distribution of the population, including professional ICU in some centers or the difference in patients' characteristics and treatment protocols.

## V. CONCLUSION:

Aggregating the results, it can be understood that unlike the the high number of ICU patients in Tehran, the mortality rate in university hospitals is so much less compared to the other countries. As explained, sex, cause of admission and the length of ICU stay, type of ICU, comorbid diseases especially hypertension and diabetes mellitus, are factors that affect mortality rate in ICU patients. Also the APACHE scoring system has a high power in predicting

the mortality risk in patients and can be used in order to improve treatment approach and cost-benefit decision making for intensivists.

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