Indian Journal of Basic and Applied Medical Research; December 2021: Vol.-11, Issue- 1, P.233-240
DOI: 10.36848/IJBAMR/2020/06215.55679

**Original article**

# Study of length of hospital stay and predictors of mortality in elderly patients admitted in medicine intensive care unit in a tertiary care hospital

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Date of received: 01 December 2021, Date of acceptance 25 Dec2021

**Abstract**

**Introduction**: Elderly patients accounts for a considerable proportion of ICU admissions. Changes in cardiovascular system with age, increasingly sedentary life style in the elderly and associated co-morbid conditions (Hypertension, Diabetes Mellitus),congestive cardiac failure, cerebrovascular diseases and other chronic diseases make them more vulnerable to hospitalization. In view of the limited data, on hospitalized geriatric patients, from resource-limited countries and its likely importance, this study was planned to identify the factors (demographic variables, clinical profile, biochemical profile, functional status) on admission which can predict short term mortality and length of hospital stay in elderly patients admitted to medicine ICU.

**Aims and Objectives**: To study the demographic, clinical and biochemical profile in elderly patients admitted to Medicine ICU in a tertiary care hospital.

To determine the factors associated with mortality in elderly patients admitted to medicine intensive care unit in a tertiary care hospital.

To determine the factors associated with length of hospital stay in elderly patients admitted to medicine intensive care unit in a tertiary care hospital.

**Materials and Methods**: A prospective observational study design was used to assess factors associated with mortality and length of hospital stay in elderly patients admitted to Medicine ICU. A total of 259 elderly patients admitted to medicine ICU were enrolled in our study having the age of 60 years or more. Out of which 36 patients were excluded who did not give written informed consent or who took discharge against medical advice. Remaining 223 elderly patients were included in the study. The Study was conducted over a period of 24 months.

**Observations & results:** Of the total 223 elderly ICU patients enrolled in this study, 128 (57.4%) were males and 95 (42.6%) were females. The mean age of elderly patients was 68.64 ± 6.91 years. The mortality in elderly patients was 27.35%. The presence of metabolic acidosis, hypotension, sepsis, need for invasive mechanical ventilation, diabetes mellitus, malignancy, impaired activities of daily living, APACHE II scores, SOFA scores, qSOFA scores, GCS scores, serum creatinine, serum bilirubin



www.ijbamr.com P ISSN: 2250-284X, E ISSN: 2250-2858

and serum albumin were significantly associated with mortality. The factors GCS score and serum albumin were independently associated with mortality in elderly patients after regression analysis. The
**Keywords**: Geriatric, metabolic acidosis, sepsis, comorbidity, mortality

**Introduction:**

Elderly population is more vulnerable to life threatening infections due to physical and functional alternations of the human body and organs. Immunosenescence and chronic low grade inflammation occur as a result of pathophysiology of ageing. Comorbidity associated with increasing age, such as diabetes mellitus, renal insufficiency, chronic lung diseases and immunosuppressive conditions pose an additive risk for infections. Frailty is an additional factor for recurrent hospitalization in elderly patients. Older persons have a reduced ability to tolerate infections, so that infections are more likely to become severe and systemic and resolve more slowly. Acute illness involving a hospital stay is associated with under nutrition and inactivity, which sometimes may be of such magnitude that the residual muscle mass fails to meet the minimal requirement for the walking(1).

**Aims & objectives**

1) To study the demographic, clinical and biochemical profile in elderly patients admitted to Medicine ICU in a tertiary care hospital.

2) To determine the factors associated with mortality in elderly patients admitted to medicine intensive care unit in a tertiary care hospital.

3) To determine the factors associated with length of hospital stay in elderly patients admitted to medicine intensive care unit in tertiary care hospital.

**Materials & methods :**

A prospective observational study design was used to assess factors associated with mortality and length of hospital stay in elderly patients admitted to Medicine ICU.

**Setting:** This study was conducted in ICU of department of Medicine of a tertiary care hospital

**Study Period:** The study was carried out for 24 months

**Ethics:**

We took permission from institution ethics committee (IEC) prior to commencement of study. Informed consent was taken from the patients prior to inclusion of patients in this study.

**Inclusion criteria:**

All consecutive elderly patients, 60 years of age or older admitted to medicine ICU and provide informed consent were included in the study.

**Exclusion criteria:**

Patients were excluded if they do not provide written informed consent, age <60 years, withdrawal of treatment during the ICU stay, discharge against medical advice.

**Observations & results**

**Demographic characteristics of elderly patients admitted in medicine ICU**

Among 223 subjects, majority 153(68.61%) were in the age group of 60-70 years. It was followed by 58 elderly patients(26.01%) who were in the age group of 70-80 years and 12(5.38%) having age of more than 80 years as shown in table 1. The mean age of elderly patients was 68.64 ± 6.91. Among the 223 elderly patients 128 were males and 95 were females. The association of age groups and gender of the elderly patients with mortality or length of hospital stay in ICU was not found to be statistically significant. Mean Length of Stay in hospital in days - 4.76
± 5 days (0-34 days). The overall in hospital mortality was 27.35%.

**Distribution of comorbidities/ Habitual history among elderly patients admitted in medicine ICU**

The most common comorbidity associated with elderly patients admitted in medicine ICU was Hypertension(39.91%), followed by Diabetes mellitus(30.94%), Ischemic heart disease(9.42%), Stroke(5.38%), COPD (3.59%), Malignancy(1.79%). Among the habitual history 16.14% of elderly patients were alcoholics and 8.52% elderly patients were smokers admitted in medicine ICU. The association of Diabetes mellitus and malignancy with mortality in elderly patients was found to be statistically significant. Whereas the association of hypertension, ischemic heart disease, COPD with mortality in elderly patients was not found to
be statistically significant. History of alcoholism and smoking was not related to mortality or length of hospital stay in elderly patients.

**Distribution of clinical variables/interventions along with length of hospital stay among elderly patients admitted in medicine ICU**

The association of invasive ventilation, sepsis and acute kidney injury was found to be statistically significant with length of hospital stay. Whereas hypotension, metabolic acidosis was not found to be statistically significant with the length of hospital stay. History of falls was also not found to be statistically significant with the length of hospital stay.

**Distribution of ICU scores and length of hospital stay among elderly patients admitted in medicine ICU**

| ICU Scores | | (Length of stay < 7 days) | (Length of stay ≥7days) | Total | P Value |
|---|---|---|---|---|---|
| GCS Score | ≤10 | 146(81.11%) | 34(18.89%) | 180(80.72%) | 0.002 p=0.96,NS |
| | 11 – 15 | 35(81.40%) | 8(18.60%) | 43(19.28%) | |
| APACHE – II | ≤30 | 173(80.47%) | 42(19.53%) | 215(96.41%) | 1.92 p=0.16,NS |
| | ≥31 | 8(100%) | 0(0%) | 8(3.59%) | |

| | | | | | |
|---|---|---|---|---|---|
| SOFA | 1 – 8 | 168(81.16%) | 39(18.84%) | 207(92.83%) | 0.00 p=0.99,NS |
| | >8 | 13(81.25%) | 3(18.75%) | 16(7.17%) | |
| qSOFA | 0 | 120(79.47%) | 31(20.53%) | 151(67.71%) | 0.88 |
| | ≥1 | 61(84.72%) | 11(15.28%) | 72(32.29%) | p=0.34,NS |

**Distribution Of Laboratory Parameters among elderly patients admitted In medicine ICU.**

Among complications occurring during hospital stay acute kidney injury (30.49%) was present in maximum number of elderly patients, followed by hypotension(8.07%), invasive ventilation(8.83%), sepsis(9.42%), metabolic acidosis(11.66%). The association of acute kidney injury, hypotension, invasive ventilation, sepsis, metabolic acidosis and restriction of daily activities during last 1 year in the elderly patients with mortality in ICU was found to be statistically significant. The association of history of falls was not found to be statistically significant with mortality.

**Mean biochemical parameters among elderly patients admitted in ICU.**

Among non survivors, mean value of serum creatinine was 2.44, mean value of sodium – 134.44, mean value of serum potassium – 4.55, mean value of hemoglobin – 11.14, mean value of ALT – 112.72, mean value of serum bilirubin – 1.68, mean value of serum albumin – 3.11. Among survivors, mean value of serum creatinine was 1.71, mean value of sodium – 132.99,mean value of serum potassium – 4.49, mean value of hemoglobin – 11.40,mean value of ALT – 99.06, for serum bilirubin – 1.07, mean value of serum albumin – 3.45. Waist to hip ratio showed mean value of 0.81 for non survivors and 0.80 for survivors. The association of mean value of serum creatinine, serum bilirubin and serum albumin with mortality in elderly patients were found to be statistically significant. While the association of mean value of serum sodium, serum potassium, hemoglobin, ALT and waist to hip ratio was not found to be statistically significant with mortality in elderly patients admitted in medicine ICU.

**Discussion:**

We enrolled a total of 223 elderly patients from medicine ICU over a 24 months period. The mean age of elderly patients was 68.64 years ± 6.91. In our study mortality among elderly patients admitted to medicine ICU was 27.35 %. Studies done by Mahajan et al.(2),Kohli et al.(3), Sodhi et al.(4), showed mortality of 41.2%, 12%, 61% and 19.6% respectively.

In our study, mean age of elderly patients admitted to medicine ICU was 68.64 years ± 6.91. Our study showed no correlation of age with mortality or length of hospital stay. This is in contrast to the result of studies done by De lange et al.(5), Liao et al.(6), Gayat et al.(7), Brown et al.(8), Mukhopadhyay et al.(9), Mazzone et al.(10), Wade et al.(11),Fuschs et al.(12), Shum et al.(13), Al-Dorzi et al.(14), Han et al.(15), Kao et al.(16),, Vosylius et al.(17), Mahajan et al.(2), Kohli et al.(3),Anneraries Docherty et al.(18), Grabowski et al.(19), which showed that ageas a significant factor associated with mortality.

In our study, out of 223 elderly patients 57.40% were males and 42.60% were females. There was no relation of gender with mortality or length of hospital stay. Studies done by De lange et al.(5), Guowei

Li et al.(20), Fuschs et al.(12), Shum et al.(13), showed that male sex was associated with mortality, Mazzone et al.(10), showed female sex was associated with increased risk of mortality.

The mean length of stay in ICU in elderly patients admitted in medicine ICU was 4.76 ± 5 days (0-34 days). The length of ICU stay was not significantly associated with age and gender of elderly patients. Studies done by Brown et al.(8), Gayat et al.(7), Lan et al.(21), Bagshaw et al.(22), showed no significant correlation between length of hospital stay with age or gender.

In the present study, comorbidities was present in elderly patients as follows: Hypertension(39.91%), Diabetes mellitus(30.94%), ischemic heart disease(9.42%), Stroke(5.38%), COPD(3.59%) and Malignancy(1.79%). Out of which diabetes mellitus and malignancy was significantly associated with mortality. Similar correlation was seen in the study done by Shum et al.(13), which showed that diabetes mellitus and malignancy was associated with increased mortality. Studies done by Liao et al.(6), Lee et al.(23), Mazzone et al.(10), Magnette et al.(24), Mukhopadhyay et al.(9), showed that malignancy was associated with increased mortality. Studies done by Gayat et al.(69), Lee et al.(23), Mazzone et al.(10), Daubin et al.(25), Han et al.(15), Kohli et al.(3), Boumendil et al.(26), stated that mortality was increased in elderly patients having more comorbidities.

Among the habitual history, 16.145% elderly patients were alcoholics and 8.52% patients were smokers. History of alcoholism or smoking was not associated with the mortality or length of hospital stay in our study. In the study done by Ando et al.(27), the association of habitual factors like smoking with mortality was found to be statistically significant.

In this study, the association of hypotension, metabolic acidosis, invasive ventilation, limitations of daily activities, sepsis, acute kidney injury with mortality was found to be statistically significant. Also, invasive ventilation, sepsis and acute kidney injury was associated with increased length of hospital stay. In study done by Gayat et al.(7), Mukhopadhyay et al.(9), Sodhi et al.(4) hypotension was statistically significantly associated with mortality. In studies done by De lange et al.(5), Liao et al.(6), Brown et al.(6), Lee et al.(23), Mukhopadhyay et al.(9), Fuschs et al.(12), Shum et al.(13), Bagshaw et al.(22), invasive ventilation was found to be statistically significantly associated with mortality. In study done by Han et al.(15), Boumendil et al.(26), decreased activities of daily living was significantly associated with mortality. Sepsis was having positive correlation with mortality in studies done by Liao et al.(6), Lee et al.(23), Magnette et al.(24), , Mahajan et al.(2), Mazonne et al.(72), In studies done by Romeo et al.(27), Mahajan et al.(2), Kohli et al.(3), Rooij et al.(28), Samuels et al.(29), acute kidney injury was statistically significantly associated with mortality.

In this study, ICU scores – GCS, APACHE-II SOFA and qSOFA were statistically associated with mortality in elderly patients admitted in medicine ICU. Similarly, De lange et al.(5), Fuschs et al.(12), Magnette et al.(24),Daubin et al.(25), Kao et al.(16), Ando et al.(27), showed that SOFA score was significantly associated with mortality.Studies done by Fuschs et al.(12), Liao et al.(6), Brown et al.(8),Guowei Li et al.(20), Lee et al.(23), Han et al.(15), Wade et al.(11), Han et al.(15), Kao et al.(16), Tripathi et al.(30), Somme etal.(31),showed that APACHE-II scores was statistically significant with mortality.

Higher ICU scores like APACHE II, SOFA score was associated with increased mortality in adult

population. It represents increased severity of illness in the admitted patients. The study done by Ying Su et al., showed that APACHE II score can accurately predict hospital mortality for patients in ICU(32) .Serum creatinine in elderly patients admitted in medicine ICU was statistically significantly associated with mortality in our study. Haemoglobin,TLCs, sodium, potassium, serum albumin, ALT, random blood sugar were not associated with mortality. Study done by Lee et al.(23), Mukhopadhyay etal.(71), showed low levels of haemoglobin was associated with increased mortality. Study done by Gayat et al.(7), showed that leucocytosis was associated with increased mortality. Study done by Lee et al.(23), Han et al.(77), Kohli et al.(3), showed that serum albumin was statistically significantly associated with mortality. The study done by Liao et al.(6), Han et al.(77), showed random blood sugar was statistically significantly associated with mortality.

**Conclusion:**

In our study, increase in bilirubin was statistically significantly associated with mortality. Similarly, study done by Lee et al.(23), showed that increase in bilirubin was associated statistically significantly with increase in mortality. The use of invasive ventilation, presence of sepsis and occurrence of AKI were significantly associated with prolonged length of hospital stay in elderly patients.

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