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Demographic and Clinical Analysis and Outcome of Critically Ill Patients in a Northern Cyprus Hospital

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BACKGROUND/AIMS
Depending on the demographic and clinical characteristics of patients, mortality rate is an indicator of the quality of community health and hospital-based healthcare. This study aimed to determine the mortality rate and basic demographic and clinical characteristics of critically ill patients in Northern Cyprus.

MATERIAL and METHODS
We retrospectively investigated the hospital records of critically ill patients who were admitted to the 14-bedded general intensive care unit of a university hospital in Northern Cyprus between August 2015 and July 2018.

RESULTS
In total, 734 patients were admitted to our hospital during the study period. The overall mortality rate of these critically ill patients was 27.11%. The mean patient age was 59.67±22.47 years. The average length of hospital stay was 16.33±38.20 days. The mortality rate was higher among men than among women although the average age of the female patients was higher than that of the male patients. The mean age of deceased patients was more than that of the survivors. There was no sex-based difference in this statistic. Patients accumulated between 60–79 years of age. Although most of the patients were transferred from the department of chest diseases, with most experiencing internal diseases, except for those in the age group of 20–29 years.

CONCLUSION
To our knowledge, this is the first study to report the mortality rate of critically ill patients in Cyprus. Our results indicate that our mortality rates are lower than those of many low-income countries.

Keywords: Age distribution, critical care, length of stay, mortality

INTRODUCTION

Critically ill patients (CIPs) are usually those that need to be managed and monitored in intensive care units (ICUs). The demographic and clinical characteristics as well as mortality rates (MRs) of these patients vary from those of other patients admitted to other wards of the hospital owing to several multifactorial variables. Usually, ICUs have higher MRs than other hospital wards. These higher MRs in ICUs are mainly because these units have patients with greater disease severity, longer length of stay (LOS) in the ICU, resistance of causative agents to anti-infectives in case of infections, and the presence of co-morbid factors, such as age, obesity, chronic heart disease, diabetes, and others (1, 2).

Many countries and institutions calculate their own MRs for CIPs to measure the improvement efforts rather than to compare with other medical facilities. Generally, calculation methods of MRs are described by the rules and regulations of medical authorities. However, no such regulations exist for the Turkish Republic of Northern Cyprus (TRNC); therefore, the MRs of CIPs are calculated for the entire Cyprus island, not for the country.

This study aimed to detect the MRs as well as demographic and clinical characteristics of CIPs who were admitted to tertiary care ICU in a hospital at the TRNC.

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MATERIALS and METHODS

Patients and Study Design: Necessary permissions were obtained from the hospital ethics committee. Patient consent was not required owing to the retrospective nature of the study. The official hospital records of CIPs admitted to tertiary care ICU between August 1, 2015 and July 31, 2018 were collected and analyzed retrospectively. A university teaching hospital provides tertiary care general ICU with 14 well-designed and equipped beds.

Clinical outcomes; demographic characteristics, such as age and sex; and LOS were recorded. The mean and standard deviation values as well as median values and interquartile ranges (IQR) were calculated for these data.

Age, mortality rate-LOS correlations and clinical distributions of all ages and 20–29 years, monthly MRs, and 28 days in-hospital mortality records were calculated and analyzed.

Exclusion Criteria

Patients admitted to the pediatric unit, newborn infants, premature children, and patients who were admitted to the ICU after cardiovascular surgery were excluded from the study because of their completely different demographic and clinical characteristics.

Statistical Analyses

The data were entered into Statistical Package for the Social Sciences version 3.0 (SPSS Inc., Chicago, IL, USA) statistical analyses software program; the t-test and Mann–Whitney U-test were used to assess the differences between the groups.

RESULTS

In total, 734 patients were enrolled in the study. The average ICU stay was 11.991 days. The occupancy rate of the ICU beds was 78.21% during the study period, and approximately 20.53 new CIPs were admitted to our ICU each month.

TABLE I. General characteristics of the study population

Total patients	734
Mean age of the study population (±SD)	59.67±22.47
Median age and IQR of the study population	66 (78-44=34)
Minimum and maximum age of the study population	7–96
Total LOS*	16.33±38.20
Total median of LOS and IQR*	7 (15-3=12)
Minimum and maximum LOS of the study population*	1–722

(*): In days. LOS: Length of stay; IQR: Interquartile ranges

Main Points:

- It is observed that the overall mortality rate in our hospital's ICU patients is not higher than the countries mentioned in the literatures.
- The average age of the patients who applied to our service was around 60 years old. These patients stayed in the ICU for an average of 16 days. 27% of these patients lost their lives.
- Although our male patients were more than women, there was no difference between mortality rates.

The total mean, median, and minimum-maximum ages and total LOS as well IQR values have been outlined in Table I.

The correlation between the age distribution of patients and clinical outcomes is presented in Figure 1. The most prevalent group was 70–79 years old at total and dead patients (24.1% and 33.65% respectively); while the majority of surviving patients were 80–89 years old (17.5%). Another remarkable result was that the higher rates in total and living patients in 20–29-year-old patients among less than 60-year-old age patients.

We classified the patients according to their sex; the clinical outcomes, mean ages, median ages, and LOS were analyzed and compared. Results have been outlined in Table 2.

The correlation of the clinical outcomes with patient sex, age, and LOS is presented in Table 3.

Figure 2 shows that majority of the subjects had been transferred from clinics of chest diseases, internal medicine, neurology, and neurosurgery (30%, 25% 17%, and 16% respectively). The difference in the outcome of those in the age group of 20–29 years led us to evaluate their clinical origin. We have outlined these results in Figure 3. The majority of these patients were re-

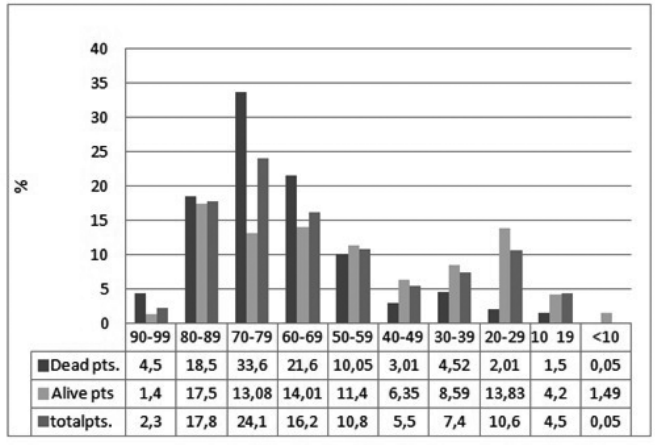

FIGURE I. The correlation between the age distribution of patients and clinical outcomes

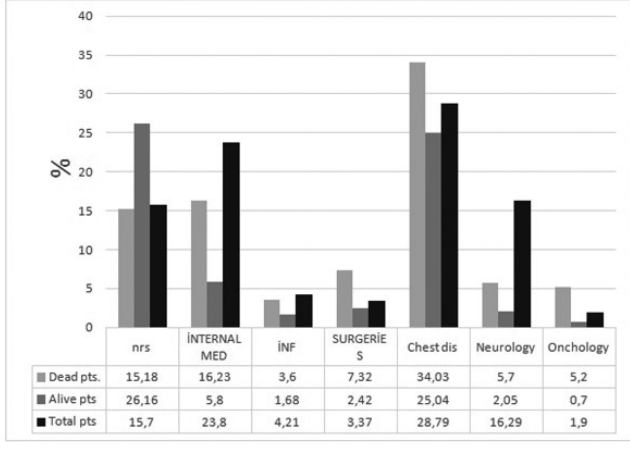

FIGURE 2. The clinical classification of the patients

ferred from internal medicine and neurology clinics rather than from chest diseases clinics, and the latter group of patients dramatically decreased down to 8% (the second lowest group of total patients).

The monthly monitoring of MRs is essential to maintain the quality of hospital care, and regular monitoring and supervision is necessary. We calculated the MRs of our hospital during the study period, and the results are outlined in Figure 4.

The average, maximum, and minimum monthly MRs were 27.11%, 44%, and 5%, respectively.

We also detected a correlation between MR and total LOS; the results are shown in Figure 5. Fourteen percent of the total deaths occurred on the first day of ICU stay, and nearly 40% of the deaths occurred within the first week of admission.

DISCUSSION

ICUs are the most critical units of hospitals because they cater to patients with greater morbidity and higher mortality risk; further, patients with different clinical diagnoses, treatments, and follow-up procedures are admitted to the ICU. MRs are the most important outcomes of these units and should be monitored continuously. These rates may vary for each hospital and

TABLE 2. Sex-based differences in the clinical outcomes, age, and LOS of the subjects

	Male	Female	p
Patient sex n (%): 734	10 (55.8%)	324 (44.2%)	0.0019*
Dead patients n (%): 199	112 (56.28)	87 (46.72)	0.1821
Surviving patients n (%): 535	298 (55.70)	237 (44.3011)	0.0091*
Mean age of the study population (±SD)	56.46±23.52	67.85±17.14	≤0.0001*
Mean age of the study population (±SD)	68.58±19.30	68.21±15.47	0.7788
Mean age of surviving patients	55.29±3.119	58.21±23.85	0.0144*
Median age of the study population (and IQR)	64 (77-42=35)	69 (78-48=30)	
Median age of dead patients (and IQR)	70 (79-62=17)	74 (71-58=13)	
Median age of surviving patients (and IQR)	60 (75-37=38)	65 (78-36=42)	
LOS* of the study population (±SD)	17.78±45.6	14.23±25.73	0.2113
Mean LOS* of dead patients (±SD)	20.53±71.08	15.71±26.83	0.2476
Mean LOS*of surviving patients (±SD)	16.75±31.44	13.69±25.35	0.1549
Median LOS* of the study population (and IQR)	7 (15-3=12)	7 (16-3=13)	
Median LOS* of dead patients (and IQR)	6 (18-2=16)	8 (19-2=17)	
Median LOS* of surviving patients (and IQR)	7 (15-3=12)	7 (15-3=12)	

(*): In days. LOS: Length of stay; IQR: Interquartile ranges

TABLE 3. Different characteristics and clinical outcomes of the study population

	Dead patients	Live patients	p
Total patients n (%): 734	n=199 (27.11)	n=535 (72.89)	p<0.0001
Male n (%): 410	112 (27.31)	298 (72.69)	
Female n (%): 324	87 (26.85)	237 (83.15)	
Mean age of the study population (±SD)	68.3±16.54	56.58±23.43	p<0.0001
Mean age of male patients (±SD)	68.58±19.30	55.29±3.119	p<0.0001
Mean age of female patients (±SD)	68.21±15.47	58.21±23.85	p<0.0001
Median age of the study population (and IQR)	72 (78-61=17)	62 (77-35=42)	
Median age of male patients (and IQR)	70 (79-62=17)	60 (75-37=38)	
Median age of female patients (and IQR)	74 (71-58=13)	65 (78-36=42)	
Mean LOS* of the study population (±SD)	18.66 (±56.02)	15.47 (±28.93)	0.3149
Mean LOS of male patients (±SD)	20.53 (±71.08)	16.75 (±31.44)	0.3194
Mean LOS* of female patients (±SD)	15.71 (±26.83)	13.69 (±25.35)	0.3453
Total Median LOS* (and IQR)	7 (18-2=16)	7 (15-3=12)	
Median LOS* of male patients (and IQR)	6 (18-2=16)	7 (15-3=12)	
Median LOS* of female patients (and IQR)	8 (19-2=17)	7 (15-3=12)	

(*): In days

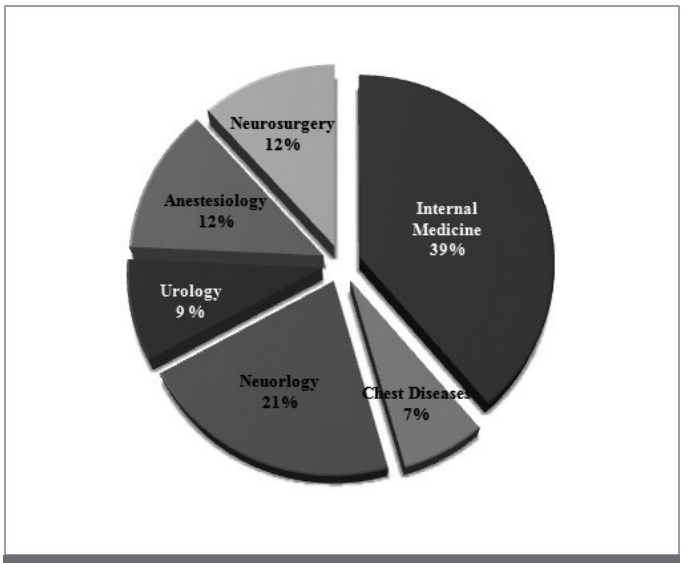

FIGURE 3. The distribution of the MR, age, and clinical characteristics of the patients

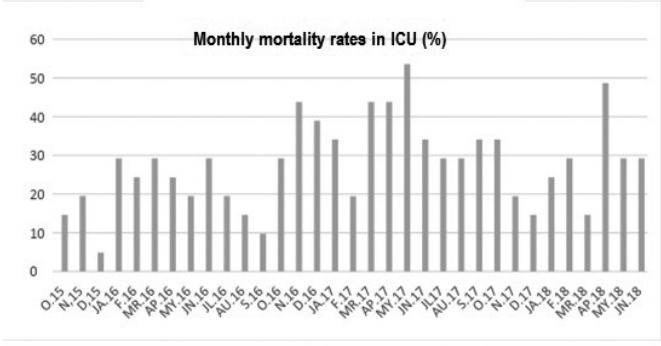

FIGURE 4. Calculation of monthly MRs during the study period

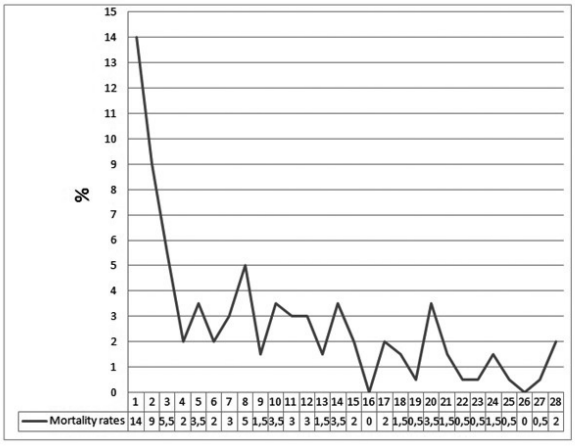

FIGURE 5. Correlation between MR and total LOS
MR: mortality rates; LOS: longer length of stay

among countries. Generally, lower-income countries tend to have higher MRs as compared to their well-developed counterparts. The total MR of our CIPs was 27.11%. Bonkoungou et al. (3) reported a MR of 43.7% at a university hospital in Burkino-Faso. Similar results have been reported by other authors in their countries (2-6). The MRs are lower in well-developed countries. Cook et al. (7) reported an MR of 17% in the USA.

Total MRs of 25.6% and 52.3% have been reported in two independent Turkish studies (8, 9). The MR reported in the second study is significantly higher than that determined in our study.

We have summarized the general characteristics of our study population in Table 1. The average ICU LOS was 16.33±38.20 days in our study. The minimum LOS was 1 day, while the maximum LOS was 722 days (only one patient stayed for an extraordinarily long time). The median LOS and IQR (days) were 7 (15-3=12) days. The median LOS and IQR show the variation in the LOS. The mean age of our patients was 59.67±22.47 years (range: 7–96 years), with more subjects belonging to the elderly age group.

As shown in Table 2, significantly more male than female patients were admitted (55.8% vs. 44.2%, p=0.0019); however, there was no difference in their MRs. More male subjects survived compared to female subjects (p=0.0091). A meta-analysis revealed dominance of male sex at 63.6% (10).

More elderly females were admitted as compared to elderly male subjects (mean age of female patients vs. that of male patients: 67.85±17.14 vs. 56.46±23.52 and p<0.0001). Although female survivors were older than male survivors, there was no sex-based difference in those who died (p=0.0144). These results were supported by the data regarding median age and IQR difference studies. Similar results have been reported by other studies (5, 6, 11). There were no significant sex-based differences in studies analyzing the LOS.

We have also compared the main characteristics of both the outcomes in Table 3. The total MR was 27.11% (p<0.0001) in our ICU. The MRs of the male and female patients were similar to that of the total study population (comparison of deaths vs. survivals: men: 27.31% vs. 72.69%, women: 26.85% vs. 83.15%). There were no sex-based differences in the outcome; however, those who died were older than those who survived (all p<0.0001). Median ages of patients were also similar. However, all three IQRs were quite different. The IQR of age for those who died was 13–17, while that for the survivors was 38–42. These results indicate that the variability in the median age of the survivors was about three times more than that for those who died. There were no differences in the mean, median, and IQR for LOS based on the outcomes.

As stated in Figure 1, the age distribution study pointed out a reciprocal curve between 79 and 20 years of ages both in total and survivor groups, while mortal cases continuously decrease in same age period. In total, 64% of the study population was aged >60 years. Age distribution sharply increased after 50 years. In this distribution, 71.2% of the patients were older than 50 years.

The clinical classification of the patients has been summarized in Figure 2. Those with chest diseases formed the majority, followed by those transferred from the internal medicine clinic.

The distribution of the MR, age, and clinical characteristics of the patients in this study has been outlined in Figure 3; these

findings prompted us to further evaluate the distribution of the clinical characteristics among those aged 20–29 years. It is noteworthy that internal medicine patients comprised the majority (40%) rather than chest diseases patients, followed by neurology patients (22%). The number of chest diseases patients decreased in the second least group.

We also calculated the monthly MRs during the study period; the results have been highlighted in Figure 4. This was the most important quality indicator of the hospital and ICU settings. This indicator should be calculated periodically. There are no mandatory regulations to detect this indicator in the TRNC. We studied these indicators in our ICU among CIPs. The average number of patients admitted to our ICU every month was 20.53, with the minimum MR being 4.87% and the maximum MR being 53.58%.

The LOS is one of the most important indicators of ICU care. Longer LOS may be related to both the patient's medical condition and the quality of medical services provided; however, this does not influences the increase in MRs.

We classified the patient's outcome according to their LOS. The highest number of deaths occurred on the day of admission (14% of the total deaths). As seen in Figure 5, 40% of the deaths in our ICU occurred within the first 15 days. Similar results were reported by Williams et al. (12) and Santamaria et al. (13). It is noteworthy that we could not detect any correlation between higher MR and longer LOS.

Study Limitations

The measurement of disease severity in the admitted patients and 28-day follow-up after discharge were not possible due to technical limitations.

In conclusion, to our knowledge, this is the first study to report on the MR of CIPs in Cyprus. Our results showed that our MRs are lower than those in many low-income countries. This basic study will be an indicative reference for further studies. The results will enable hospital authorities to enhance and improve their quality of care.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of the Near East University Medical Research Ethics Committee. (Approval Date: 14.09.2018, Approval Number: NEU/2018/59/618).

Informed Consent: Due to the retrospective design of the study, informed consent was not taken.

Peer-review: Externally peer-reviewed.

Author contributions: Concept – A.A., N.Ç.; Design – A.A., N.Ç., İ.G.; Supervision – A.A., N.Ç.; Resource A.A., N.Ç., İ.G.; Materials – A.A., N.Ç.; İ.G., S.B.Ö., K.S.; Data Collection and/or Processing – A.A., N.Ç.; İ.G., S.B.Ö., K.S.; Analysis and/or Interpretation A.A., N.Ç, İ.E.; Literature Search - A.A., N.Ç.; Writing - A.A.,N.Ç.,; Critical Reviews - A.A., N.Ç., İ.G., S.B.Ö., K.S., İ.E.

Conflict of Interest: The authors have no conflicts of interest to declare.

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