flora

RESEARCH ARTICLE/KLİNİK ÇALIŞMA

FLORA 2024;29(1):129-138 • doi: 10.5578/flora.202401979

Nurse Workload in the Intensive Care Unit Dedicated for Patients with COVID-19 During Two Different Periods of the Pandemic

Pandeminin İki Farklı Döneminde COVID-19 Hastaları için Ayrılmış Bir Yoğun Bakım Ünitesindeki Hemşire İş Yükü

Hümeyra ZENGİN(İD), Tuba MÜFTÜOĞLU(İD), Filiz ÇİÇEK(İD)

Directorate of Nursing Services, Hacettepe University Adult Hospital, Ankara, Türkiye

Cite this article as: *Zengin H, Müftüoğlu T, Çiçek F. Nurse workload in the intensive care unit dedicated for patients with COVID-19 during two different periods of the pandemic. FLORA 2024;29(1):129-138.*

ABSTRACT

Introduction: *This study was conducted to determine the nurse workload in the intensive care unit dedicated for with COVID-19 patients in two different periods of the pandemic.*

Materials and Methods: *The research is a descriptive and observational study. This study is conducted in two periods (first period 04.10.2020-27.12.2020 and second period 01.05.2021-19.06.2021). Study periods were selected in the autumn and spring seasons, as there are periods that can be considered as risk factors for COVID-19 disease. Information on the descriptive characteristics of each patient hospitalized in the ICU in weekly periods and information from the TISS-28 tool for determining nurse workload were collected by the researchers. A weekly nurse work list was created for this intensive care unit and the patient nurse ratio per shift was used in the study. Descriptive statistics and independent t-tests were used for data analysis.*

Results: *In this study, 93 patients were followed up in the first period and 53 patients in the second period. The mean age of the patients hospitalized in the intensive care unit was 64.25 ± 13.95 in the first period and 67.58 ± 15.21 in the second period. Female patients were 36.6% and male patients were 63.4% in the first period, while female patients were 37.7% and male patients were 62.3% in the second period. There was no significant difference between the mean length of stay between the two periods (14.51 ± 11.61 in the first period, 16.53 ± 12.75 in the second period). The mean score of TISS 28 was 20.74 ± 2.74 in the first period and 21.03 ± 3.48 in the second period (p> 0.05). During the study, the patient-nurse ratio was mostly 2:1 at weekly intervals.*

Conclusion: *Nurse workload in the intensive care unit where COVID-19 patients were monitored was calculated similarly in different periods of the pandemic.*

Key Words: *Nursing; Nurse workload; TISS-28; COVID-19; Intensive care unit*

Received/Geliş Tarihi: 16/10/2023 - Accepted/Kabul Ediliş Tarihi: 01/12/2023

©Copyright 2024 by Flora. Available on-line at www.floradergisi.org.

This is an open access article under the Creative Commons AttributionNonCommercial 4.0 International (CC BY-NC 4.0) License.

Available Online Date: 22.03.2024

ÖZ

Pandeminin İki Farklı Döneminde COVID-19 Hastaları için Ayrılmış Bir Yoğun Bakım Ünitesindeki Hemşire İş Yükü

Hümeyra ZENGİN, Tuba MÜFTÜOĞLU, Filiz ÇİÇEK

Hacettepe Üniversitesi Erişkin Hastanesi, Hemşirelik Hizmetleri Müdürlüğü, Ankara, Türkiye

Giriş: *Bu çalışma, pandeminin iki farklı döneminde COVID-19 hastalarına ayrılmış yoğun bakım ünitesindeki hemşire iş yükünü belirlemek amacıyla yapılmıştır.*

Materyal ve Metod: *Araştırma tanımlayıcı ve gözlemsel bir çalışmadır. Bu çalışma iki dönemde (1. dönem 04.10.2020-27.12.2020 ve 2. dönem 01.05.2021-19.06.2021) gerçekleştirildi. Araştırmacılar tarafından haftalık periyotlarda YBÜ'de yatan her bir hastanın tanımlayıcı özelliklerine ilişkin bilgiler ve hemşire iş yükünü belirlemek için de TISS-28 aracında yer alan bilgiler toplandı. Bu yoğun bakım için haftalık hemşire çalışma listesi oluşturuldu ve her vardiya için hasta hemşire oranı bu çalışmada kullanıldı. Veri analizi için tanımlayıcı istatistikler ve bağımsız t-testi kullanıldı.*

Bulgular: *Bu çalışmada birinci dönemde 93 hasta, ikinci dönemde 53 hasta izlendi. Yoğun bakım ünitesinde yatan hastaların yaş ortalaması ilk dönemde 64.25 ± 13.95, 2. dönemde 67.58 ± 15.21 idi. İlk periyotta kadın hasta oranı %36.6, erkek hasta oranı %63.4 iken, 2. periyotta kadın hasta oranı %37.7, erkek hasta oranı ise %62.3 idi. İki dönem arasında ortalama yatış günleri arasında anlamlı bir fark yoktu (ilk dönemde 14.51 ± 11.61, ikinci dönemde 16.53 ± 12.75). TISS 28 puan ortalaması ilk dönemde 20.74 ± 2.74 iken 2. dönemde 21.03 ± 3.48 olarak bulundu (p> 0.05). Çalışma süresince haftalık dilimlerde hasta hemşire oranı çoğunlukla 2:1 idi.*

Sonuç: *COVID-19 hastalarının izlendiği yoğun bakım ünitesindeki hemşire iş yükü pandeminin farklı dönemlerinde benzer şekilde hesaplanmıştır.*

Anahtar Kelimeler: *Hemşirelik; Hemşire iş yükü; TISS-28; COVID-19; Yoğun bakım ünitesi*

INTRODUCTION

COVID-19 disease first started to be seen in March 2020 and caused a pandemic by affecting the whole world in waves[1,2]. In addition to, the number of nurses with COVID-19 contacts, COVID-19 disease positivity and legal leave/sickness reports increased day by day throughout the hospitals and additional manpower was needed in hospitals during the pandemic. This period has necessitated changed in the planning of the workforce of the existing personnel working in hospitals and the number of personnel in the unit where they work[3]. In Italy, it was reported that more workforce was needed at the peak of the pandemic and that there were potential risks such as patient safety and quality of care may have fallen below the required standards as new graduates started working in intensive care units[4]. In particular, ICU are environments where critical patients are closely monitored, high-risk drug treatments such as intensive antibiotherapy and multiple vasepressor support are performed, and invasive procedures are applied quite frequently[5]. It has been reported that patient care is insufficient and treatment costs increase in intensive care units with a high nurse workload[6,7]. It is necessary to plan the personnel who are equipped with special knowledge and skills in these areas properly. Health workforce planning aims to optimize the size and structure of the health workforce according to the care needs of individuals and communities. This plan also affects the health of the population, health care costs and access to health services.

Recently, it has gained importance to determine the patient/nurse ratio by calculating the nurse workload with the nursing activities scoring systems. As a matter of fact, in a study conducted in Belgium, it was concluded that patients hospitalized in intensive care due to COVID-19 require significantly more nursing time and the patient-nurse ratio should be approximately 1:1. In this study, it was reported that an increase in the number of intensive care nurses is needed to adequately manage new

waves of COVID-19 or other possible infectious disease pandemics[8].

It is reported that it is difficult to objectively assess the workload of nurses in ICUs. Many scoring systems are used to calculate the workload of nurses[9,10]. One of the tools widely used in calculating the workload of nurses is The Therapeutic Intervention Scoring System-28 (TISS-28)[11]. TISS was developed as a tool to classify patients according to the severity of the disease. It is based on the principle that the number of therapeutic interventions correlates with the severity of the patient's clinical conditions. The more severe the patient's condition, the greater the number of therapeutic interventions required for treatment. That is, the higher the TISS-28 score, the longer the nursing time spent on patient care. This study was conducted to determine the nurse workload in an intensive care unit at different periods of the COVID-19 pandemic with the TISS-28 tool.

MATERIALS and METHODS

This research is a descriptive and observational study. The study was conducted in the intensive care unit (ICU) dedicated to COVID-19 patients of a tertiary university hospital with 807 beds in Hacettepe University Adult Hospital. The ICU is registered as a tertiary ICU and is a 25-bed intensive care unit where each patient is hospitalized as a single person in a negative pressure room. In this intensive care unit, 45 nurses work in two shifts of twelve hours per day and 40 hours per week. The number of nurses working in the unit is usually determined as two patients for one nurse, and nurse workload scoring tools are not routinely used in this unit. Study periods were selected in the autumn and spring seasons, as there are periods that can be considered as risk factors for COVID-19 disease. The study was conducted between 4th November 2020 to 27th December-2020 for the first period and between and 1st May 2021 to 19th June 2021 for the second period. All patients hospitalized in this intensive care unit between the specified dates were included in the study. Data were collected by the researchers on the same day and time every week before the weekly work lists were made. TISS-28 score was calculated in weekly periods in order to predict the nurse workload that may occur for the next week. The data collected consisted of the descriptive characteristics of each patient hospitalized in the ICU and the information included in the TISS-28 score for nurse workload determination.

Study Sample/Participants

The inclusion criteria were as follows:

- Patients admitted in the ICU in the period under analysis.
- Patients with ≥18 years old at the time of admission.

The exclusion criteria were as follows:

- Patients with a length of ICU stay of fewer than 24h.

Applying the inclusion and exclusion criteria described above, we obtained a total sample of 146 patients in critical condition.

Data Collection Tools

Patient information form

This form consists of a total of six questions on socio-demographic characteristics (e.g. age, sex, hospitalization period, presence of chronic disease, outcome,).

Theurapeutic intervention scoring system-28 (TISS-28)

Initially a scoring system reflecting the severity of illness, TISS is now used in the evaluation of nursing activities. In the TISS-28 scoring system, seven main chapter (basic activities, ventilation, cardiovascular, renal, renal, neurological, metabolic support and other special interventions) are scored between 1-78. The relationship between the TISS-28 score and the time spent at the bedside for all nursing activities is linear and one point on the TISS-28 corresponds to 10.6 minutes spent at the bedside[12]. The calculation of the data obtained in the study was done as follows:

a. To determine the nursing workload of a patient according to the TISS-28 Score, the TISS-28 Score obtained from the patient is multiplied by 10.6 minutes.

b. To calculate the number of nurses to work in the unit, the number of inpatients in the unit is multiplied by the total average TISS-28 Score.

c. Nurse working time for a patient is calculated by converting the number of nurses working in the shift and the shift hours worked by the nurse into minutes.

d. In the calculation of the required/or increased nurse time for the same unit, the total nurse working time is subtracted from the nurse working time calculated for all patients.

e. The number of nurses required is calculated by dividing the required or incremental nurse working time by the shift hours converted into minutes.

Weekly nurse worklist

This is the list of nurses who will work in the intensive care unit reserved for COVID-19 patients in two shifts according to the number of patients. Only the number of nurses per shift from this list was used in this study.

Statistical Analysis

The data obtained in the study were analyzed using the free trial version of SPSS Statistics (Statistical Package for Social Sciences) for Windows 25.0 program. Descriptive statistical methods (number, percentage, mean, standard deviation) were used to evaluate the data. Chi-square analysis was used to test the homogeneity of the groups. The data used were tested for conformity to normal distribution. Conformity to normal distribution can be examined with Q-Q Plot drawing[12]. In addition, the normal distribution of the data used depends on the skewness and kurtosis values being between ± 3[13]. Independent t-test for the difference between two independent groups was used to compare quantitative data in normally distributed data. The findings obtained were accepted as significant at 95% confidence interval and p value< 0.05.

RESULTS

The study included ninety three patients in the first period and fifty three patients in the second period. The mean age of the patients hospitalized in the intensive care unit was 64.25 ± 13.95 in the first period and 67.58 ± 15.21. In the second period, female patients were 36.6% and male patients were 63.4% in the first period, while female patients were 37.7% and male patients were 62.3% in the second period. In the first period, the mean intensive care unit length of stay was 14.51 ± 11.61, while in the second period, the mean intensive care unit length of stay was 16.53 ± 12.75. Looking at the intubation status of the patients according to the periods, intubated patients in the first period were 45.2% and non-intubated patients were 54.8%, while intubated patients in the second period were 49.1% and non-intubated patients were 50.9%. Transfer from the intensive care unit to the ward and discharge status of the patients were 68.8% in the first period and 77.4% in the second period. Deceased rates were 31.2% in period 1 and 22.6% in period 2. There was no statistically significant difference between the demographic characteristics of the patients followed up between period 1 and period 2 (Table 1).

The mean score of the TISS-28 scale in COVID 19 intensive care units was 20.74 ± 2.75 in the first period and 21.03 ± 3.48 in the second period. There was no statistical difference p> 0.05 between the mean scores of the TISS-28 scale in period 1 and period 2 (Table 2.) The mean scores of TISS-28 subgroups were calculated as basic activities 10.7 ± 2.15, respiratory support 4.11 ± 2.18, cardiovascular support 3.37 ± 3.78, renal support 1.67 ± 1.01, neurologic support 0.06 ± 0.49, metabolic support 0.78 ± 1.03, and special interventions 0.06 ± 0.43 in the observations made in period 1, whereas in period 2 TISS-28 subgroup mean scores were calculated as basic activities 10.46 ± 2.75, respiratory support 3.50 ± 2.70, cardiovascular support 4.02 ± 3.49, renal support 1.76 ± 0.91, metabolic support 10.60 ± 1.26, special interventions 0.24 ± 0.87. According to the results of the comparison of TISS-28 subgroup mean scores between the two periods, respiratory support was statistically significant in the first period observations (p< 0.05), while special interventions were statistically significant in the second period observations (p< 0.05) (Table 2).

Table 1. Demographic, clinical characteristics and laboratory findings at the time of admission of the groups participating in the study

Characteristics			1st Period (n= 93)		2nd Period (n= 53)		Test Value	p
			n	%	n	%		
Sex		Female	34	36.6	20	37.7	0.020**	0.887
		Male	59	63.4	33	62.3		
Intubation		Intubated	42	45.2	26	49.1	0.206**	0.650
		Not intubated	51	54.8	27	50.9		
Presence of Chronic Disease		Yes	78	83.9	50	94.3	3.423**	0.064
		No	15	16.1	3	5.7		
Outcome	Status	Alive	64	68.8	41	77.4	1.220**	0.269
		Deceased	29	31.2	12	22.6		
	Delivery to service	Yes	64	68.8	41	77.4	1.220**	0.269
		No	29	31.2	12	22.6		
	Discharge	Yes	64	68.8	41	77.4	1.220**	0.269
		No	29	31.2	12	22.6		
Total			93	100.0	53	100.0		
Characteristics			1st Period (n= 93)		2nd Period (n= 53)		Test Value	p
			$\bar{X}$	SS	$\bar{X}$	SS		
Age			64.25	13.95	67.59	15.21	-1.340***	0.182
Hospitalization day			14.51	11.61	16.53	12.75	-0.975***	0.331

*p< 0.05.
**Chi-square analysis.
***Independent t test.

When the averages of the observation results of the TISS-28 study conducted in two different periods were examined, the number of patients in the first period was 23.75 ± 1.38, the TISS-28 score was 20.74 ± 2.74, and the number of nurses needed was 1.65 ± 2.00. In the second period, the number of patients was 13.5 ± 5.05, the TISS-28 score was 21.03 ± 3.48, and the number of nurses needed was 1.11 ± 1,37. There was a statistically significant difference between the number of patients, nurse working time for all patients, number of nurses working on shift and total nurse working time between the two periods (p< 0.05). In the first period, the number of patients, nurse working time for all patients, the number of nurses working in shifts and total nurse working time were higher than in the second period. There was no statistically significant difference between the two periods in the mean TISS-28 scores and the number of nurses needed (Table 3).

For the internal medicine intensive care unit, nurse workload was evaluated using the TISS-28 scale for each patient 16 times in 16 weeks before and after the nurse work lists were made for two months. In the evaluations made in weekly periods, patient/nurse ratios were mostly planned at a ratio of 2:1 in both periods in accordance. However, as seen in Table 4, TISS-28 scores were calculated differently each week, and in parallel with this, it was observed that the nurse workload also changed. In the weeks when the average total TISS-28 score increased, the workload and the number of nurses required for that week increased linearly, and in the weeks when the total TISS-28 score decreased, the number of nurses required for that week also decreased.

Table 2. Comparison of mean scores of subgroups of TISS-28

	1st Period (n= 93)		2nd Period (n= 53)			
Subgroups of TISS-28	**Mean**	**SD**	**Mean**	**SD**	**Test Value**	**p**
Core activities	10.7	2.15	10.46	2.75	0.824**	0.410
Respiratory support	4.11	2.18	3.50	2.70	2.141**	0.033*
Cardiac support	3.37	3.78	4.02	3.49	-1.461**	0.145
Renal support	1.67	1.01	1.76	0.91	0.758*	0.449
Neurological support	0.06	0.49	0.00	0.00	1.312**	0.083
Metabolic support	0.78	1.03	10.2	1.26	-1.758**	0.080
Special interventions	0.06	0.43	0.24	0.87	2.344**	0.02*

*p< 0.05.
**Independent t test.

Table 3. Comparison of TISS-28 score averages and nurse workload in different periods in COVID-19 intensive care unit

	1st Period (n= 93)		2nd Period (n= 53)			
Variables	$\bar{X}$	**SD**	$\bar{X}$	**SD**	**Test Value**	**p**
Number of patients	23.75	1.39	13.50	5.50	5.108**	**0.000***
Average TISS-28 Score	20.74	2.75	21.03	3.48	-0.182**	0.858
Nurse work time for one patient according to mean TISS-28 score	219.91	29.10	222.69	37.12	-0.166**	0.870
Nurse working time for all patients	5231.50	848.55	3054.87	1452.16	3.660**	**0.003***
Number of nurses working in shift	9.25	0.47	5.25	2.43	4.565**	**0.000***
Total nurse working time	4440.00	222.20	2520.00	1168.73	4.565**	**0.000***
Required/Increased nurse working time	794.87	964.36	534.87	6578.76	0.630**	0.539
Number of nurses needed	1.65	2.00	1.11	1.37	0.631**	0.538

*p< 0.05.
**Independent t test.

DISCUSSION

Considering the characteristics of the patients included in the study, we observe that the mean age of the patients is close to the results of the studies conducted by Simxes et al. and Wang et al. and the proportion of male patients hospitalized in intensive care is higher than that of females[9,14]. We know that as the duration of intensive care hospitalization of patients increases, their nursing care needs also increase[15]. In the studies conducted in the pre-COVID-19 period, the mean hospitalization in the intensive care unit was calculated as 4.61 ± 3.36, while it was calculated as 5 ± 6.4 and 8.8 ± 6.1[9,16]. It has been reported that the average length of stay in the intensive care unit in the COVID-19 pandemic is six days, and this period has been extended to eight days with concomitant infections[16]. In another multicenter study, the average length of stay in the intensive care unit was 12 days[17]. According to the results of a study conducted in the same intensive care unit in the pre-COVID-19 period, length of stay is reported as 9.4 ± 5.6[18]. In this study, we found that the average length of ICU stay of the patients was longer in both periods.

In this study, the data of a total of 146 patients were collected during the COVID-19 intense eight weeks. It was calculated that there was a statistically significant difference in the number of patients between the observations made in two periods (p< 0.05) (Table 3).

Table 4. Patient to nurse ratio. TISS-28 score averages and nurse workload distributions in the COVID-19 intensive care unit in the weekly periods of different periods

	1st Period (04.11.2020/27.12.2020)								2nd Period (01.05.2021/19.06.2021)							
Variables	1. week	2. week	3. week	4. week	5. week	6. week	7. week	8. week	1. week	2. week	3. week	4. week	5. week	6. week	7. week	8. week
Number of patients	23	24	23	25	25	25	24	21	23	19	16	13	9	12	9	7
Number of nurses working in shift	9	9	10	9	9	9	9	10	9	8	7	5	3	4	3	3
Patient/Nurse ratio (per day)	2.56	2.67	2.30	2.78	2.78	2.78	2.67	2.10	2.56	2.38	2.29	2.60	3.00	3.00	3.00	2.33
Average total TISS-28 score	19.13	18.16	18.95	17.92	23.88	25.44	21.2	21.3	25.47	18.15	21.63	16.15	20.11	21	19.33	19.33
Nurse workload for one patient according to mean TISS-28 score	202.8	192.6	200.9	189.9	253.1	269.6	224.7	225.7	269.9	190.8	229.2	171.1	213.1	222.6	204.8	280
Nurse workload for all patients	4664	4621	4621	4748	6325	6740	5393	4740	6208	3625	3667	2224	1917	2671	2167	1960
Total nurse working time	4320	4320	4800	4320	4320	4320	4320	4800	4320	3840	3360	2400	1440	1920	1440	1440
Required/Increased nurse workforce time	344	301	-179	428	2032	2420	1073	-60	1888	-215	307	-176	477	751	727	520
Number of nurses needed	0.71	0.62	-0.37	0.89	4.23	5.04	2.24	-0.12	3.93	-0.44	0.63	-0.36	0.99	1.56	1.51	1.08

During the COVID-19 pandemic, the number of patients served in the intensive care unit reserved only for these patients in two periods was variable. We think that the reason for the decrease in the number of patients who applied to our center in the second period is due to the decrease in the severity and incidence of the disease. In addition, we interpret it as reducing the need for intensive care of patients due to the development of treatment protocols for the treatment of COVID-19 disease in the second period.

In this study, the data of a total of 146 patients were collected during the COVID-19 intensive unit eight weeks. It was calculated that there was a statistically significant difference in the number of patients between the observations made in two periods ($p< 0.05$) (Table 3). We think that the reason for the decrease in the number of patients who applied to our center in the second period is due to the decrease in the severity and incidence of the disease. In addition, we interpret it as reducing the need for intensive care of patients due to the development of treatment protocols for the treatment of COVID-19 disease in the second period. Although there was no periodic difference between the TISS-28 mean score calculation, when analyzed in weekly periods, it was observed that the TISS-28 scores were calculated differently from each other every week, and in parallel, the nurse workload also changed. In our study, we observed the patient-nurse ratio is mostly 2:1 on a daily basis and rarely this ratio is 3:1.

In addition, when the data were evaluated, differences emerged in TISS-28 subgroup score calculation. Respiratory support (0.033, $p< 0.05$) was found to be statistically significant in the observations made in the first period when comparing the TISS-28 subgroup mean scores in the first and second periods. In the systematic review conducted by Simxes et al., it was mentioned that basic activities ranked first in TISS-28 subgroup calculations and respiratory support followed in the second place, and this evaluation overlaps with our study[14]. In the second period observations, special interventions were found to be statistically significant ($p< 0.05$). It was thought that there was a significant difference between the periods because one patient received extra corporeal membrane oxygenation (ECMO) treatment in the second period. It is reported that this special intervention requires workforce preparation, is a complex and intensive treatment, is challenging for healthcare personnel, and causes burnout and anxiety[19]. During the pandemic, ECMO treatment was frequently applied with the view that it may be beneficial in COVID-19 patients[20].

It is possible to say that as the TISS-28 scores increase, the severity of the disease increases and the nurse workload increases in the same direction[11]. In a study conducted in an intensive care unit, the mean score of TISS-28 was found to be 30.76 ± 6.86 vs. 24.67 ± 5.48[21]. In our study, the mean TISS-28 score in the first period was calculated as 20.74 ± 2.74, and the TISS-28 score in the second period was calculated as 21.03 ± 3.48. In our study, especially in weekly calculations, as the TISS-28 scores increase; in other words, as the severity of the disease increases, the number of nurses needed also increases.

Nurses who provide care and treatment to patients in the COVID-19 pandemic witnessed by the whole world have faced the risk of infection because they are in constant contact with the patient due to the nature of their profession[22]. While nurses are expected to work in highly complex and uncertain environments such as a pandemic, where all national resources are mobilized, nurses are also expected to adapt quickly to the numerous changes brought by the pandemic[23]. In the face of all these risks and expectations, it may be inevitable to experience burnout and anxiety for nurses who work with an excessive workload. In the COVID-19 pandemic, making the nurse workload weekly and making calculations as periods becomes important in determining the work planning and nurse workload of the next week[4,8,24]. It is recommended that nursing workload measurements should be carefully determined by clinicians and hospital administrators, and these results should be used during routine practices[25]. Thus, the feeling of burnout in nurses and the

anxiety of working under excessive workload can be reduced and safer patient care can be provided. Especially in disaster situations, nurse workforce planning according to patient care needs can be a guide to use the workforce in institutions efficiently and to take measures in advance of the problems to be experienced.

The primary limitation of this study was conducted in the COVID-19 intensive care unit of a university hospital in Hacettepe University Adult Hospital. Since non-COVID-19 intensive care units are not included in the study, they do not provide information about the nurse workload and the need for nurse manpower in these intensive care units. The study is a observational study and evaluated data for only two periods. These results may not be generalizable to other ICUs. There is a need for future studies on the efficient use of nurse workforce, especially in crisis periods such as disasters, according to patient care needs.

CONCLUSION

In the intensive care unit where COVID-19 patients were monitored during different periods of the pandemic, the need for nurse workforce varies especially in weekly periods. Nurse workforce planning in intensive care units based solely on the patient-nurse ratio does not reflect the actual workload. The care needs of each patient are unique and care needs may vary over time. While the COVID-19 pandemic put forward the importance of training a sufficient number of intensive care nurses, it has shown that with the increase in intensive care beds, nurse workload has increased and there are disruptions in patient care quality. Evaluating the workforce need in intensive care units and determining the number of nurses per patient can be guiding in terms of using the workforce in institutions efficiently, especially in disaster situations.

ETHICS COMMITTEE APPROVAL

The authors declared that the study was conducted in accordance with the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", (amended in October 2013). In this study no direct personal/patient information was collected.

CONFLICT of INTEREST

The authors have no conflicts of interest to declare that are relevant to the content of this article.

AUTHORSHIP CONTRIBUTIONS

Concept and Design: HZ

Analysis/Interpretation: All of authors

Data Collection or Processing: All of authors

Writing: HZ, TM

Review and Correction: HZ

Final Approval: All of authors

REFERENCES

1. *Chang LY, Yu HH, Chao YC. The relationship between nursing workload, quality of care, and nursing payment in intensive care units. J Nurs Res 2019;27:1-9. https://doi.org/10.1097/jnr.0000000000000265*
2. *Hoogendoorn ME, Brinkman S, Bosman RJ, Haringman J, de Keizer NF, Spijkstra JJ. The impact of COVID-19 on nursing workload and planning of nursing staff on the intensive care: A prospective descriptive multicenter study. Int J Nurs Stud 2021;121:104005. https://doi.org/10.1016/j.ijnurstu.2021.104005*
3. *Lucchini A, Iozzo P, Bambi S. Nursing workload in the COVID-19 era. Intensive Crit Care Nurs 2020;61:102929. https://doi.org/10.1016/j.iccn.2020.102929*
4. *Bambi S, Iozzo P, Lucchini A. New issues in nursing management during the COVID-19 pandemic in Italy. Am J Crit Care 2020;29:e92-e3. https://doi.org/10.4037/ajcc2020937*
5. *Hamsen U, Lefering R, Fisahn C, Schildhauer TA, Waydhas C. Workload and severity of illness of patients on intensive care units with available intermediate care units: A multicenter cohort study. Minerva Anestesiol 2018;84:938-45. https://doi.org/10.23736/S0375-9393.18.12516-8*
6. *Jones D, McLaughlin M, Gebbens C, Terhorst L. Utilizing a scope and span of control tool to measure workload and determine supporting resources for nurse managers. J Nurs Adm 2015;45:243-9. https://doi.org/10.1097/NNA.0000000000000193*
7. *Van Den Oetelaar W, Van Stel H, Van Rhenen W, Stellato R, Grolman W. Balancing nurses' workload in hospital wards: Study protocol of developing a method to manage workload. BMJ Open 2016;6:e012148. https://doi.org/10.1136/bmjopen-2016-012148*
8. *Bruyneel A, Gallani MC, Tack J, d'Hondt A, Canipel S, Franck S, et al. Impact of COVID-19 on nursing time in intensive care units in Belgium. Intensive Crit Care Nurs 2021;62:102967. https://doi.org/10.1016/j.iccn.2020.102967*

9. *de Souza Urbanetto J, Travi Canabarro S, Prado Lima Figueiredo AE, Weber G, Pereira dos Santos R, Stein K, et al. Correlation between the TISS-28 and NEMS indicators in an intensive care unit. Int J Nurs Pract 2014;20:375-81. https://doi.org/10.1111/ijn.12183*
10. *Chang LY, Yu HH, Chao YC. The relationship between nursing workload, quality of care, and nursing payment in intensive care units. J Nurs Res 2019;27:1-9. https://doi.org/10.1097/jnr.0000000000000265*
11. *Padilha KG, Sousa RM, Kimura M, Miyadahira AMK, da Cruz DALM, de Fátima Vattimo, et al. Nursing workload in intensive care units: A study using the therapeutic intervention scoring system-28 (TISS-28). Intensive Crit Care Nurs 2007;23:162-9. https://doi.org/10.1016/j.iccn.2006.07.004*
12. *Chan Y. Biostatistics 101: Data presentation. Singapore Med J 2003;44:280-5.*
13. *Shao AT, Zho KZ. Marketing research: An aid to decision making: South-Western/Thomson Learning 2002.*
14. *Simões JL, Sa-Couto P, Simões CJ, Oliveira C, Dos Santos NM, Mateus J, et al. Nursing workload assessment in an intensive care unit: A 5-year retrospective analysis. J Clin Nurs 2021;30:528-40. https://doi.org/10.1111/jocn.15570*
15. *Chima-Melton C, Murphy TE, Araujo KL, Pisani MA. The impact of race on intensity of care provided to older adults in the medical intensive care unit. J Racial Ethn Health Disparities 2016;3:365-72. https://doi.org/10.1007/s40615-015-0162-3*
16. *Mimouni H, Bouchlarhem A, Lafkih A, Haddar, L, Lamzouri O, Bkiyar H, et al. Factors influencing the length of stay in the moroccan intensive care unit in patients surviving critical COVID-19 infection. Ann Med Surg (Lond) 2022;79:104108. https://doi.org/10.1016/j.amsu.2022.104108*
17. *Ñamendys-Silva SA, Alvarado-Ávila PE, Domínguez-Cherit G, Rivero-Sigarroa E, Sánchez-Hurtado LA, Gutiérrez-Villaseñor A, et al. Outcomes of patients with COVID-19 in the intensive care unit in Mexico: A multicenter observational study. Heart Lung 2021;50:28-32. https://doi.org/10.1016/j.hrtlng.2020.10.013*
18. *Ortaç Ersoy E, Abdülkerim Ş, Öz A, Aslan G, Bozkurt Kavak P, Fakılı D, et al. Evaluation of nursing workload in intesive care unit. Yoğun Bakım Derg 2017;8;1-5. https://doi.org/10.5152/dcbybd.2017.1353*
19. *Bertini P, Guarracino F, Falcone M, Nardelli P, Landoni G, Nocci M, et al. ECMO in COVID-19 patients: A systematic review and meta-analysis. J Cardiothorac Vasc Anesth 2022;36:2700-6. https://doi.org/10.1053/j.jvca.2021.11.006*
20. *Wang ZW, Zheng J, You LM, Wang YX, Gao MR, Guan XD. Evaluation of the simplified therapeutic intervention scoring system: Chinese version. Intensive Crit Care Nurs 2018;45:85-90. https://doi.org/10.1016/j.iccn.2017.09.009*
21. *Ross P, Watterson J, Fulcher BJ, Linke NJ, Nicholson AJ, Ilic D, et al. Nursing workforce, education, and training challenges to implementing extracorporeal membrane oxygenation services in Australian intensive care units: A qualitative substudy. Australian Critical Care 2022. https://doi.org/10.1016/j.aucc.2021.12.003*
22. *Dzinamarira T, Murewanhema G, Mhango M, Iradukunda PG, Chitungo I, Mashora M, et al. COVID-19 prevalence among healthcare workers. A systematic review and meta-analysis. Int J Envir Res Pub Health 2022;19:146. https://doi.org/10.3390/ijerph19010146*
23. *Borges EM das N, Queirós CML, Vieira MRFSP, Teixeira AAR. Perceptions and experiences of nurses about their performance in the COVID-19 pandemic. Available from: http://periodicos.ufc.br/rene/article/view/60790 (Accessed date: 26.07.2023). https://doi.org/10.15253/2175-6783.20212260790*
24. *Wynne R, Davidson PM, Duffield C, Jackson D, Ferguson C. Workforce management and patient outcomes in the intensive care unit during the COVID-19 pandemic and beyond: A discursive paper. J Clin Nurs 2021;10.1111/jocn.15916. https://doi.org/10.1111/jocn.15916*
25. *Racy S, Davidson PM, Peeler A, Hager DN, Street L, Koirala B. A review of inpatient nursing workload measures. J Clin Nurs 2021;30:1799-809. https://doi.org/10.1111/jocn.15676*

Address for Correspondence/Yazışma Adresi

Dr. Hümeyra ZENGİN

Directorate of Nursing Services,
Hacettepe University Adult Hospital,
Ankara, Türkiye

E-posta: zenginhumeyra@gmail.com