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Original Article

Nursing Section

Evaluation of Nurses' Workload in the Intensive Care Unit, Neonatal Intensive Care Unit and Coronary Care Unit: An Analytical Study

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ABSTRACT

Introduction: The workload on nurses can have adverse effects on the patient, nurse and healthcare system such as reduced quality of care, increased risk of nursing errors, reduced patient satisfaction, increased nurse anxiety, increased nursing job stress, increased risk of infection, increase in the length of hospital stay and increased risk of death.

Aim: The present study was designed and conducted to compare nurses' workload in the Intensive Care Unit (ICU), Neonatal Intensive Care Unit (NICU), and Coronary Care Units (CCU).

Materials and Methods: The present study is a cross sectional analytical study that was conducted in the ICU, NICU and CCU of educational hospitals affiliated to Qazvin University of Medical Sciences. The convenience sampling method was used. A nursing activity score was used to assess nurses' workload. The total score in this instrument is between zero and 178. Data were analysed using SPSS 16. Pearson correlation coefficient, chi-square, independent t-test, one-way analysis of variance was used.

Results: The mean score of the total workload in nurses was 104.19±25.18. Regarding the primary purpose of the study, the results of the present study showed that the mean score of nurses' workload was significantly higher in nurses working in the NICU than nurses working in the ICU and CCU ($p<0.05$). Among the demographic variables, only the marital status was significantly associated with nurses' workload, that married nurses experienced more workload in some shifts ($p<0.05$).

Conclusion: Nurses working in NICUs experienced a higher level of workload compared to the nurses in ICU and CCU. Due to the high workload of nurses in the NICU and the complications that this can cause for neonatal patients and nurses, it is necessary to pay more attention to the distribution of nurses in these wards.

Keywords: Critical care units, Nursing care, Nursing staff, Resource management

INTRODUCTION

The critical care units include ICU, NICU and CCU which are one of the essential and vital pillars of hospitals that accommodates critically ill patients who are at risk of death. These units can be effective in restoring health to critically ill patients by providing proper medical services as well as optimal use of modern medical equipment and using experienced and qualified staff and group decision-making about the patients [1]. A significant portion of the personnel in the ICU are nurses [2]. Nursing is one of the most critical professions that play a crucial role in treating and improving the condition of patients [3]. The workload of nurses can have adverse effects on the patient, nurse and healthcare system such as reduced quality of care, increased risk of nursing errors, reduced patient satisfaction, nurse anxiety, nursing job stress, risk of infection, in the length of hospital stay and the risk of death [3-9].

The workload is the amount of work done by a person per unit of time [5]. Previous studies on nurses' workloads have focused on nurses working in the ICU [10-12], and fewer studies have focused on nurses working in the CCU and NICU [10,13]. The results of a study conducted among nurses working in the ICU showed that nurses working in these ward bear a lot of workloads [10]. In a study in the CCU department in Brazil, researchers reported that nurses' workload in the CCU was not high and that the nurse-patient ratio was well observed in these wards [11].

As mentioned, studies on the workload of nurses in the past have been more related to nurses working in ICUs and fewer nurses working in NICUs and CCUs. Also, the comparison of workload among nurses working in the ICU, NICU, and CCU has not been studied in detail. Debergh DP et al., pointed out that the type of ward can be a factor in the nurses' workload [14], and nurses working in ICU, NICU, and CCU may experience different workloads. Knowledge in this regard can be used to distribute human resources in these wards. Therefore, the present study was designed and conducted to compare nurses' workload in the ICU, NICU and CCU.

MATERIALS AND METHODS

The present study was a cross-sectional analytical study conducted in the ICUs of educational hospitals affiliated to the Qazvin University of Medical Sciences. The data collection was done from February 2019 to April 2019. This study was conducted under the supervision of the Ethics Committee of Qazvin University of Medical Sciences (Ethics code: IR.QUMS.RES.1396.195). Participants or their relatives were requested to sign an informed consent form.

The study population included all patients admitted to the ICU, NICU and CCU of the educational hospitals affiliated to Qazvin University of Medical Sciences and remained more than 24 hours in these wards. Sampling was done by census and included all nurses working in these wards. Nurse's inclusion and exclusion criteria were having experience of more than six months in critical care units and consent to participant in the study. Nurses working in only one shift (only morning) were excluded.

Data Collection Tools

a) Checklist of demographic variables

The checklist was developed by researchers after communicating communication with nursing faculty members and included age, gender, marital status, level of education, workplace ward, work experience in ICUs, and nurse-patient ratio in the wards.

b) Nursing Activity Score (NAS)

The NAS was developed by Miranda DR et al., [15]. The tool consists of seven main categories that includes: 1) basic activities (monitoring and titration, biochemical and microbiological examinations, medication, patient hygiene procedures, care of drains except nasogastric tube, patient mobilisation and positioning, support

and care of patients and their relatives, and administrative and managerial task); 2) Ventilatory support (respiratory system support, artificial airways caring, treatment for improving lung function); 3) Cardiovascular support (vasoactive medication injection, irrespective of type or dose, intravenous replacement of large fluid losses, left atrium monitoring with using pulmonary artery catheter with or without cardiac output measurement, cardiopulmonary resuscitation after arrest; in the past 24 hours); 4) Renal support (haemofilteration techniques and dialysis techniques if patient need, patient urine output measurement); 5) Neurological support (measurement of patient intracranial pressure); 6) Metabolic support (management of patient metabolic acidosis or alkalosis, enteral and parenteral feeding); and 7) Specific intervention (X-rays, echocardiography, pace maker, electrocardiogram, stomach lavage, venous and atrial catheter insertion). The total score represents the nurse's time spent in direct care in a shift. The total score in this tool is a score between zero and 178. Higher score in NAS indicate higher level of activity [13]. In previous studies, this tool has been translated into Persian and its validity and reliability have been determined at a good level [10]. For determining face validity of Persian version, opinion of 10 nursing faculty members was obtained by Alizadeh M et al., for reliability they used inter-rater method and reported a correlation of 0.75 [10].

The nurses' workload was measured by the researcher for 24 hours (morning, evening, and night). During 24 working hours, the researcher attended the ICU, NICU, and CCU and completed the NAS for each patient in all three shifts based on the nurses taking care of the patient.

Data Analysis

The SPSS-16 software was used to analyse the data. Descriptive statistics (frequency, mean, and standard deviation) and inferential statistics of Pearson correlation coefficient, independent t-test, one-way analysis of variance were used. The significance of these tests was less than 5%.

RESULTS

In total, the workload of 214 nurses was examined in three shifts. Of the 214 nurses in the present study, 31 (14.5%) worked in the NICU, 39 (18.2%) worked in the CCU, and 144 (67.3%) worked in the ICU. Nurse-patient ratio in the wards was usually 3:1 in all wards [Table/Fig-1].

The mean score of the total workload in nurses was 104.19±25.18. The mean score of nurses' workload was significantly higher in nurses working in NICU (113.64±27.1) than nurses working in ICU (107.28±24.4) and CCU (85.53±24.1) [Table/Fig-2].

Results of Pearson correlation test did not showed significant relationship between nurses workload and their age (p=0.969). Regarding the relationship between nurses workload and other demographic variables, the results showed that among the demographic variables, only the marital status was significantly related to nurses' workload, that married nurses experienced more workload in some shifts [Table/Fig-3].

Parameters	Variables	Number of subjects n (%)
Nurses gender	Male	27 (12.6%)
	Female	187 (87.4%)
Nurses age	20-25 years	38 (17.8%)
	26-30 years	78 (36.4%)
	31-35 years	59 (27.6%)
	36-40 years	33 (15.4%)
	41 years and higher	6 (2.8%)
Nurses marital status	Married	134 (62.6%)
	Single	80 (37.4%)
Nurses level of education	Bachelor degree	195 (91.1%)
	Master degree	19 (8.9%)
Nurses work experience	1-5 years	86 (40.2%)
	6-10 years	77 (36%)
	11-20 years	49 (22.9%)
	21 years and higher	2 (0.9%)

[Table/Fig-1]: Critical care nurses demographics characteristics.

Ward	Morning shift	Evening shift	Night shift	Average workload score
NICU	124.98±28.3	113.63±29.9	102.39±32.3	113.64±27.1
CCU	101.05±33.9	80.6±27.7	74.93±21.3	85.53±24.1
ICU	128.27±27.1	101.3±28.9	92.2±30.7	107.28±24.4
ANOVA test results	F=13.9 df (2,211) p-value for morning shift <0.001	F=12.3 df (2,211) p-value for evening shift <0.001	F=8.18 df (2,211) p-value for night shift <0.001	F=14.39 df (2,211) p-value for total score of NAS between wards <0.001

[Table/Fig-2]: Nurses' workload in NICU, ICU and CCU in different shifts.
One-way analysis of variance (ANOVA) was used for comparing mean score of NAS between nurses with different level of education and work experience

DISCUSSION

The results of the present study showed that the workload was lower among nurses working in the CCU and significantly higher among nurses working in the NICU.

The results of the present study in the first section showed that the workload of nurses working in all three wards of ICU, CCU and NICU is high. Previous studies have shown relatively similar results. In a study in Taiwan, Liu LF et al., reported that the workload of nurses in this country is high which is in line with the results of the present study [16]. In that study, one of the reasons for the high workload of nurses was that many nurses in the country were reluctant to work in hospital settings, and therefore the workload of the group working in the hospital was increased. This is not true for nurses in Iran. In Iran, many nurses with a bachelor's degree are unemployed due to a lack

Ward		Morning shift	Evening shift	Night shift	Total workload score	p-value
Gender	Men	121.2±27.9	100.1±29.4	91.1±28.3	104.1±25.1	0.91
	Women	123.1±30.7	99.2±30.5	90.4±30.8	104.2±26.5	
Marital status	Single	125.34±29.9	93.9±28.3	86.1±27.1	101.7±24.3	0.011
	Married	121.32±30.5	102.6±31.1	93.2±32.1	105.7±27.3	
Education level	Bachelor	122.84±30.7	100.24±30.7	91.2±31.1	103.7±26.8	0.09
	Master	122.64±26.1	90.5±24.7	83.1±23.7	98.7±19.7	
Nurses work experience	1-5 years	123.1±27.6	101.7±24.2	91.6±22.5	104.9±19.9	0.07
	6-10 years	122.2±29.5	99.3±20.2	91.1±18.2	104.4±26.5	
	11-20 years	121.4±23.2	100.7±17.9	92.3±15.9	104.7±17.9	
	21 years and higher	122.9±21.9	100.2±28.7	90.6±16.8	104.5±17.3	

[Table/Fig-3]: Relationship between nurses workload and their demographic variables.
Independent t-test and ANOVA were used; ANOVA were used for comparing mean score of NAS between nurses with different level of education and work experience; Independent t-test was used for comparing mean score of NAS between men and women and married and single nurses

of employment in hospitals because of lack of financial resources. This has increased the workload of employed nurses. In another study, Arghami SH et al., who examined the workload of nurses in different wards in the hospital, found that nurses working in ICUs experienced a high level of workload [17]. Due to the high workload of nurses in ICUs including NICU, ICU, and CCU, it is necessary for this issue to be considered and the necessary interventions should be made in this regard.

A study in Iran by Alizadeh M et al., reported that the workload of nurses in the CCU was lower than that of nurses working in other units which were consistent with the findings of the present study [10]. The results of the present study showed that the workload of nurses in the NICU was higher compared to nurses in ICU and CCU. This finding may be because since in the NICU, neonates are usually entirely dependent on healthcare team members, especially nurses. While patients in the CCU are in some situations able to meet their own care needs. The NICU is a special care unit in which the patient-to-nurse ratio can adversely affect the quality of care [18]. In this regard, a study in 2019 reported that the high workload of nurses in the NICUs increases missed nursing care in these wards [19]. In another study in 2017, Küng E et al., reported that increasing the workload of nurses in NICUs increases the risk of blood infections in these wards [20]. In a 2019 study, Babaei Pouya A et al., reported that the high workload of nurses in the NICU increases the incidence of nursing errors [21]. It was recommended that more studies be conducted in this area.

Limitation(s)

The most significant number of nurses in the present study were nurses working in ICU, and a smaller number in NICU, and CCU. This is the major limitation.

CONCLUSION(S)

Nurses' workloads in NICU, ICU, and CCU, are different. Hospital managers should pay more attention to the distribution of nursing staff in these wards. Due to the high workload of nurses in the NICU and the complications that this can cause for neonatal patients and nurses, it is necessary to pay more attention to the distribution of nurses in these wards.

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