Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

RELATIONSHIPS AMONG NURSE STAFFING, WORKLOAD PERCEPTION, WORK ENVIRONMENT SATISFACTION, NURSE PERFORMANCE, AND PATIENT OUTCOMES IN HEALTH CARE SETTING: CORRELATIONAL RESEARCH DESIGN

AMANY AHMED ABDRBO

PhD, Assistant Professor of Nursing Management and Informatics at Riyadh ELM University, Nursing College, Saudi Arabia.

CHEHEREZADE GHAZI

Professor of Family and Community Health Nursing, Badr University in Cairo.

RANDA MAMDOUH GAD ALLAH

Lecturer of Medical-Surgical Nursing, Medical Military Academy.

SARA ELSAYED ABD EL ATTY

Lecturer of Nursing Administration, Cairo University.

SOMAYA AHMED BAYOUMY

Professor of Nursing Administration- Badr University in Cairo, Cairo University, Egypt.

Abstract

Background: Nurse staffing, measured by nurse-patient ratios, workload perceptions, and work environment satisfaction, is associated with nurse performance and patient outcomes. Poor staffing and heavy workload can contribute to decreases in quality of care, burnout, and an increased number of adverse patient outcomes. This study aimed to examine nurse staffing, perception of workload, work environment satisfaction, nurses' performance, and their relation to patient outcomes in the context of a hospital in Egypt. **Methods:** A descriptive, correlational cross-sectional study design was used, with 200 nurses and 240 patient records surveyed. Participants were in the medical surgical, intensive care, and oncology units in a tertiary hospital in Egypt. The study instruments included a demographic questionnaire, perceived workload scale, work environment satisfaction scale, assessment of nurse-patient ratio, and nursing performance evaluation checklist. Patient outcome data were obtained from patient medical records (30-day mortality, 7-day readmission, and length of stay). Analyses included descriptive statistics, independent t-test, one-way ANOVA, Chi-square, and Pearson correlation. **Results:** Significant differences in the nurse-patient ratios existed across the departments ($F=61.38$, $p<0.001$); the ratio was highest in the medical-surgical units. A statistically significant inverse relationship between the nurse-patient ratio and satisfaction with the work environment, and several domains of nursing performance, was demonstrated, including assessment, implementation, professionalism, documentation, and education. Perceived workload was significantly negatively correlated with communication, assessment, diagnosis, implementation of nursing practice, work satisfaction, and performance evaluation domains, including implementation and professionalism. Increased nurse-patient ratios had a significant relationship with 7-day readmissions ($t=2.25$, $p=0.03$). Differences in 30-day mortality were significant between departments ($\chi^2=92.04$, $p<0.001$) and found mainly among ICU patients. **Conclusion:** Nurse staffing was significantly correlated with nursing performance and some of the selected patient outcomes. High nurse-patient ratio and work overload were correlated with poor nursing performance and low work environment satisfaction. Despite the lack of

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

significant association between workload perception, patient acuity, dependence, and satisfaction with work environment on patient outcomes, there may be an indirect association. Improved staff assignment and working environments could be beneficial for increasing the quality of nursing practice in Egypt.

Keywords: Nurse Staffing, Perception of Workload, Work Satisfaction, Nurse Performance, Patient Outcomes.

INTRODUCTION

Nurse-patient ratios and nurse workload have a profound impact on patient outcomes, nurse performance, and healthcare quality. Research has shown that the optimal nurse-patient ratio guarantees patient safety, minimizes errors, and enhances the quality of care (Patrician et al., 2024). High workloads and low nurse-patient ratios may contribute to burnout and poor performance by nurses, which may lead to lower patient outcomes, such as increased mortality, readmission rates, and length of hospital stay (Dall'Ora et al., 2022).

Healthcare facilities in Egypt are often faced with staff shortages and increasing patient demand, which worsens the nurse-patient ratios (Ahmed et al., 2023). This study examines the relationship between nurse-patient ratios and perceived nurse workload, nursing performance, and patient outcomes. The research provides evidence-based insights for identifying these linkages to inform policy changes, improve healthcare delivery, and improve staffing practices (Arruum et al., 2024).

LITERATURE REVIEW

The ratio of nurses to patients is a critical component influencing nurse performance and patient outcomes. Studies showed that the higher the ratio of nurses to patients, the higher the level of stress experienced by nurses, the more burnout they have, and the less likely they are to provide high-quality care; conversely, the lower the nurse-patient ratio, the better patient outcomes (Lasater, Sloane, et al., 2021). Nurse staffing at acceptable levels provides nurses with more opportunities to observe patients and communicate with them, which positively impacts safety and continuity of care. Nevertheless, nurse-patient ratios not only impact the quality of care for patients but also influence team collaboration and the working environment (Dall'Ora et al., 2022).

Workload perception among nurses is another critical consideration when assessing staffing adequacy, as this affects both performance and outcome results. Workloads, a high number of patients, extended hours of work, and administrative tasks impose a considerable strain on the physical and psychological health of nurses. Research has indicated that nurses' high workload leads to the inability to provide quality care and causes errors in administering medications, missed care opportunities, and decreased patient satisfaction (Jin et al., 2023; Martins et al., 2025). In addition, workload perception has been identified as one of the key factors in job dissatisfaction among nurses, as well as exacerbating staff shortage in the healthcare facility (Batiha, 2025).

The adverse impacts of understaffing and high workloads do not end there; they also affect the psychological state of mind and job satisfaction of nurses. Burnout is a condition

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

usually linked to prolonged occupational stress experienced by nurses (Leiter & Maslach, 2024). The more burned-out nurses become, the less satisfied they tend to be with their jobs, the lower their commitment becomes, and the stronger their intention to leave (Chen et al., 2019). Hence, healthcare facilities find it difficult to keep up with their demand for skilled nurses, creating further understaffing issues. On the contrary, positive working conditions and adequate staffing have been associated with higher work environment satisfaction rates, lower cases of burnout, and workforce sustainability (Al-Sawy, 2024).

In addition to affecting nurses' experiences, insufficient staff and high workload may have far-reaching effects on patient safety and healthcare quality. Evidence shows that hospitals with a higher ratio of nurses to patients have an increased risk of negative patient outcomes such as infections, falls, and mortality. A systematic review showed that an increase in the number of patients per nurse increases the risk of patient death (Dall'Ora et al., 2022). Moreover, evidence from studies in high-income countries suggests that a shortage of nursing staff jeopardizes patient safety and the quality of healthcare services provided in hospitals (Imam et al., 2022).

Considering mounting evidence about the influence of staffing on health outcomes, many nations have enacted legislation and developed staffing ratios based on workload. The state of California passed the nurse-patient ratio act in 1999, whereas Western Australia adopted the Nursing Hours per Patient Day (NHPPD) policy in 2002, whereby staffing is determined based on patient acuity (Twigg et al., 2021). The above staffing models have been shown to have favorable relationships among sufficient staffing, better patient outcomes, and nurse retention. Moreover, a systematic review found that nursing shortages negatively affect the quality of care and nurse turnover rates (Bae, 2024). While the studies offer convincing international literature on the need for optimal staffing, most current studies have been carried out in affluent healthcare environments.

Though there are many findings from international research on these issues, there have been few studies exploring their interconnections within the Egyptian context. The healthcare system in Egypt encounters several difficulties, such as a lack of resources, a shortage of workers, variations in regulations, and sociocultural issues (Ahmed et al., 2023; El-Sobky & Aladdin, 2024; Naguib et al., 2021). It means that research results obtained in developed countries cannot always be generalized to Egyptian healthcare institutions. That is why the study of the interrelations between these variables in the context of Egyptian healthcare facilities is crucial to make recommendations on staff policy.

To overcome these barriers, healthcare facilities must implement a wide range of interventions aimed at increasing optimal staffing and the overall quality of the working conditions for nurses. These interventions could involve changes in staffing in relation to patient acuity and balancing life and work for nurses, as well as offering psychological support to nurses (Galiano et al., 2023; Pryor et al., 2024). Solving issues within the organization may help reduce the workload, improve nurses' job satisfaction, and performance.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

While there is abundant international literature indicating links between nurse staffing, workload perception, work environment satisfaction, nurse performance, and patient outcomes, few studies have assessed these variables together in under-resourced healthcare systems like those found in Egypt. Most current literature stems from affluent countries with distinct healthcare environments, nurse staffing practices, and organizational resources, hindering the transferability of research results to healthcare institutions in Egypt. Moreover, most prior research studies have investigated either nurse staffing, workload, or work environment aspects individually without analyzing their combined relationships on nurse performance and patient outcomes. Finally, conflicting results concerning the link between nurse staffing and patient mortality rates necessitate additional research.

Theoretical Framework

The current research is based on Donabedian's Model of Healthcare Quality, which defines quality of healthcare through the three interconnected elements of quality, such as structure, process, and outcomes (Evans et al., 2023). The structural determinants in the current research include nurse-patient ratio, workload, acuity of patients, patient dependence, and work environment satisfaction. Nurse performance is the element that represents the process aspect, while patient outcomes, such as LOS, 7-day readmissions, and 30-day mortality, are outcome factors. Based on the Donabedian approach, structures determine the process, which in turn impacts outcomes (Patrician et al., 2024).

Significance of the Study

This research focuses on the relationship between nurse-patient ratios and workload, the performance of nurses, and patients' outcomes within the context of a hospital environment. Understanding these variables and their interrelationships is essential for enhancing patient safety, promoting nurse wellness, and achieving a higher level of healthcare provision. The findings of this research can shed light on the importance of nurse staffing and workloads on the provision of quality care and inform decision-makers about the changes that may improve patient outcomes and enhance hospital management.

METHODS

Aim

This study aimed to investigate the relationship between nurse-patient ratio, workload perception, work environment satisfaction, nurse performance, and patient outcomes.

Research Question

What are the relationships among nurse-patient ratio, workload perception, work environment satisfaction, nurse performance, and patient outcomes?

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

Study design

The study employed a descriptive correlational cross-sectional design to investigate the relationships among nurse-patient ratio, workload perception, work environment satisfaction, nurse performance, and patient outcomes.

Study setting

This study was conducted in the medical-surgical, ICU, and oncology units of a tertiary hospital in Egypt that offered emergency, inpatient, outpatient, and surgical healthcare services.

Sample and participants

A convenience sampling method was applied to obtain eligible participants from the selected units, where full-time working nurses within the hospital units were chosen to be the subjects. 200 nurses and 240 patient record information was obtained in this study. This sample size was considered adequate due to many previous correlation studies related to nurse staffing, workload, nurse performance, and patient outcomes (Kurniawati et al., 2023; Ross et al., 2023; Song et al., 2024). Nurses directly providing patient care who have at least six months of clinical experience at the chosen units were included. Nurses who hold any managerial position or administrative position, temporary employees, part-time employees, nurses who have long-term leaves of absence, or nurses who were on training were excluded from the study. Head nurses who oversaw staff nurses were asked to evaluate staff nurses' performances using an observation checklist, and patient outcome information was collected through patients' chart data from the hospital information system.

Instruments

Nurse Demographics and Work-Related Characteristics

Nurses completed a questionnaire on the following demographic and work-related factors: age, sex, education, years of experience, department, and shift pattern. Patient acuity and patient dependency were measured by two items derived from the Synergy Model of the American Association of Critical-Care Nurses (Curley, 2014). Patient acuity indicates the degree of instability of patients' conditions, and patient dependency indicates patients' functional status regarding activities of daily living. Nurses reported their patients perceived an average level of acuity (1 = not at all acute, 4 = very acute) and dependency (1 = very independent, 4 = very dependent) over the last month on a 4-point scale from 1 (low) to 4 (high). These items were previously validated by MacPhee et al. (2017)

Work Environment Satisfaction

Satisfaction with the work environment was measured with a single-item question using a 5-point Likert scale from 1 (very dissatisfied) to 5 (very satisfied) (Donley, 2021).

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

Nurse–Patient Ratio

The nurse–patient ratio was determined as the number of patients per nurse in a shift (Arruum et al., 2024). Participants were asked to list the number of patients assigned and the number of direct care nurses on duty on each of their shifts, then the ratio was calculated by dividing the number of patients by the number of direct care nurses as MacPhee et al. (2017) have done.

Perceived Nurse Workload

The Perceived Nurse Workload was measured by five items which reflect nurses' workload experience during the last 4 weeks, for example, working over the assigned shift hours, and having demands more than their adequate capacity. They were answered using a 5-point Likert scale from 0 (strongly disagree) to 4 (strongly agree), where a higher score indicates the highest perceived workload (Shields, 2006). The analysis using principal component with varimax rotation confirmed a single factor and explained variance 69.1%; factor loading values ranged from .65 to .74. This measure had been reported to be reliably valid in an earlier study with Cronbach's alpha = .78 (Havaei & MacPhee, 2020), while Cronbach's alpha in the present study was .64.

Nurses' Performance Evaluation Checklist

The nurses' performance was evaluated using the Nurses' Performance Evaluation Checklist, originally developed by Cobb (2008) and then adapted by Ahmed et al. (2023). The instrument measures performance of expected behavior in the hospital, nursing process, patient education, and quality of care. The subdomains were courtesy, respect, communication, comfort, responsiveness, teamwork, professionalism, assessment, diagnosis, implementation, evaluation, documentation, quality, and education. The response scale was a 5-point Likert scale: 1=unacceptable to 5=outstanding. An above-68 % is considered adequate nurses' performance (El-Ghabor, 2014). The validity of the content was excellent and tested by an expert (Mohamed & Gaballah, 2018). and a high reliability test in previous studies (Cronbach's α =.95, test-retest reliability r = .68, p< .001). For the current study, the Cronbach's alpha was.98.

Patient Outcomes

Three types of patient outcomes are used: 30-day mortality, 7-day readmission, and length of stay (LOS). Data were collected from the hospital information system. Mortality is defined as the death of a patient within 30 days of admission to the hospital. 7-day readmission is defined as the re-admission of the patient into the hospital within 7 days after discharge. Length of stay is defined as a continuous measurement from admission to discharge (Arruum et al., 2024).

Procedure

Before collecting the data, the research was granted approval by the Institutional Review Board and the hospital administration. Nurses who met the inclusion criteria were approached after receiving information on the study and providing their consent for participation. In terms of nurses' data, demographics, nurse-patient ratio, perceived

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

workload, and work environment satisfaction measures were gathered. The observation checklist was used by the head nurses to evaluate the nurses' performance, while 30-day mortality, 7-day readmission, and length of stay were obtained from the hospital information system.

Data Analysis

Data was analyzed using the SPSS Statistics version 26 (IBM SPSS). Normality of the data was assessed before the inferential analyses were conducted. Descriptive and inferential statistical analyses were conducted using percentages, frequencies, means, and standard deviations to describe the different variables. Independent t-test, one-way ANOVA, Chi-square, and Pearson correlation were used to identify the relationships between nurse-patient ratio, perceived workload, work environment satisfaction, nurse performance, and patient outcomes. Cronbach's alpha coefficients were computed to determine the reliability of the instruments, and a $p < .05$ level was used for statistical significance.

Ethical Consideration

This study was approved by the Institutional Review Board (BUC-IACUC-241020-109) according to the guidelines for conducting research. All participants provided consent and voluntarily decided to participate. Nurses were informed about the objective, procedure, confidentiality of the data collected, and their right to withdraw from the study at any time without any penalization.

RESULTS

Nurses' Characteristics

Most nurses were females (80%) with an associate degree (79%). The average age of the nurses was 26.37 years (SD = 3.65), and an average experience of 6.38 years (SD = 3.58). Most of the participants were working on med-surg (44%) and ICU units (41.5%), and 66.5% nurses had rotating shifts. Nurse to patient ratios were between 0.33 and 6.67 patients per nurse, with a mean ratio of 2.14 (SD = 1.30). For perceptions of nurse workload, patient acuity, patient dependency, and work environment satisfaction, moderate mean scores were recorded, including 2.36 (SD = 0.47), 2.57 (SD = 0.97), 2.60 (SD = 1.01), and 3.22 (SD = 0.68), respectively. In terms of nurse performance, higher mean scores were found for respect (M = 3.26, SD = 0.49), documentation (M = 3.08, SD = 0.71), and responsiveness (M = 3.04, SD = 0.59); while comparatively lower mean scores were for evaluation (M = 2.39, SD = 0.44), comfort (M = 2.63, SD = 0.68), and implementation (M = 2.69, SD = 0.39) demonstrated comparatively lower scores [Table 1].

Patients' Characteristics

Patients had a mean age of 46.42 years (SD = 17.77), and the mean length of hospital stay was 10.27 days (SD = 15.24). Most patients were male (57.5%). Seven-day

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

readmission and thirty-day mortality rates were both 9.2%. More than half of the patients were admitted to medical-surgical units (53.3%) [Table 2].

Departmental Differences in Nurse-Patient Ratio

A one-way ANOVA demonstrated statistically significant differences in nurse-patient ratios across hospital departments (F = 61.38, p < .001). Medical-surgical units demonstrated the highest nurse-patient ratios compared with ICUs and oncology departments [Table 3].

Correlations Among Study Variables

Higher nurse-patient ratios were significantly associated with reduced work environment satisfaction (r = −. 28, p <. 01) and poorer performance in multiple domains of nursing, including courtesy, comfort, responsiveness, teamwork, professionalism, assessment, diagnosis, implementation, and documentation/quality/patient education. The highest and negative correlations found were between perceived team workload and patient dependency (r =. 30, p <. 01). Perceived workload showed significant negative correlations with communication, assessment, diagnosis, and implementation of care. It had negative correlations with nurse-patient ratio, patient acuity, patient dependency, overall workload perception, and a positive correlation with implementation of care (r = .15, p < .05) [Tables 4 & 6].

Patient Outcomes Across Departments

The analysis revealed statistically significant differences in length of stay across departments (F = 13.76, p 28 days) and the time a patient spent in an ICU directly correlated with their length of hospitalization, e.g., ICU patients had longer times hospitalized since surgery. No statistically significant differences were found by department for seven-day readmission. In contrast, thirty-day mortality was considerably different according to departments (χ^2 = 92.04, p <. 001), and mortality was mostly among ICU patients [Table 5].

Associations Between Study Variables and Patient Outcomes

Length of stay was not significantly associated with nurse-patient ratio, patient acuity, patient dependency, workload perception, or work environment satisfaction. However, the nurse-patient ratio demonstrated significant differences according to seven-day readmission (t = −2.25, p = .03) and thirty-day mortality (t = 5.98, p < .001). No statistically significant differences were identified for patient acuity, dependency, workload perception, or work environment satisfaction according to patient outcomes [Table 7].

Table 1: Descriptive Statistics for the Nurses' Variables (N=200)

Variable		N		%	
Gender	Male	40		20	
	Female	160		80	
Education	Diploma	42		21	
	Associate	158		79	
Department	Medical Surgical	88		44	

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

	ICU	83		41.5	
	Oncology	29		14.5	
Shift	Days	39		19.5	
	Nights	28		14	
	Rotating	133		66.5	
Variable		**Min**	**Max**	**Mean**	**SD**
Age		21	35	26.37	3.65
Years of Experience		1	15	6.38	3.58
Nurse Patient Ratio		.33	6.67	2.14	1.30
Perceived Nurse Workload		1.20	3.60	2.36	.47
Patient Acuity in the last month		1	4	2.57	.97
Patient Dependency in the last month		1	4	2.60	1.01
Work Environment Satisfaction		1	5	3.22	.68
Nurses' Performance					
Courtesy		1.75	5.00	2.80	.60
Respect		1.75	5.00	3.26	.49
Communication		1.33	5.00	2.86	.49
Comfort		2.00	5.00	2.63	.68
Responsiveness		1.50	5.00	3.04	.59
Teamwork		1.17	5.00	2.75	0.57
Professionalism		2.20	5.00	2.77	0.76
Assessment		2.00	5.00	2.83	0.80
Diagnosis		2.00	5.00	2.89	0.76
Implementation		1.50	4.67	2.69	0.39
Evaluation		1.50	5.00	2.39	0.44
Documentation		2.40	5.00	3.08	0.71
Quality		2.23	5.00	2.90	0.67
Education		2.25	5.00	2.94	0.67

Table 2: Descriptive Statistics for the Patients' Variables (N=240)

Variable		**Mean**	**SD**
Age		46.42	17.77
Length of Stay		10.27	15.24
Variable		N	%
Gender	Male	138	57.5
	Female	102	42.5
7-Day Readmission		22	9.2
Thirty-Days Mortality		22	9.2
Department	Medical- Surgical	128	53.3
	ICU	50	20.8
	Oncology	62	25.8

Table 3: ANOVA between Department and Nurse-Patient Ratio

Department	**N**	**Mean**	**SD**	**F**	**P**
Medical-Surgical ICU	88 83	2.91 1.20	1.34 .28	61.38	<.001
Oncology	29	2.56	1.26		

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

Table 4: Correlation Among Nurse-Patient Ratio, Patient Acuity, Dependency, Perceived Nurses' Workload, Work Environment Satisfaction, LOS, and the Nurses' Performance

	Variable	1	2	3	4	5
	1. Nurse-Patient Ratio	-				
	2. Average Patient Acuity	-0.09	-			
	3. Average Patient Dependency	**-.15***	**.87****	-		
	4. Perceived Nurse Workload	0.08	**.30****	**.30****		
	5. Work Environment Satisfaction	**-.28****	**-.31****	**-.29****	**-.22****	-
Nurse Performance	6. Courtesy	**-.14***	0.12	0.07	-0.01	0.04
	7. Respect	-0.11	0.10	0.03	-0.03	0.11
	8. Communication	-0.05	-0.02	-0.06	**-.21****	0.07
	9. Comfort	**-.26****	0.06	-0.04	-0.12	0.07
	10.Responsiveness	**-.22****	0.00	-0.09	-0.09	0.10
	11.Teamwork	**-.17***	0.03	-0.02	-0.13	0.08
	12.Professionalism	**-.27****	0.08	-0.01	-0.13	0.04
	13.Assessment	**-.31****	0.07	0.01	**-.15***	0.08
	14.Diagnosis	**-.19****	0.06	-0.02	**-.15***	0.04
	15.Implementation	**-.16***	-0.10	**-.14***	**-.20****	**.15***
	16.Evaluation	-0.09	0.04	0.03	-0.07	-0.02
	17.Documentation	**-.30****	0.14	0.08	-0.08	0.00
	18.Quality	**-.26****	0.05	-0.02	-0.11	0.07
	19.Education	**-.28****	0.06	0.02	-0.06	0.06

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5: Differences in Patient Outcomes Across Departments

Department	LOS		7-Day Readmission		30-Day Mortality	
	M	SD	N	%	N	%
Medical- Surgical	1.89	1.14	15	11.7	0	0
ICU	3.25	.89	3	6	22	44
Oncology	2.10	1.48	4	6.5	0	0
Overall	2.15	1.30	22	9.20	22	9.2
Test	F=13.76, P<0.001		χ^2 =2.15, P=0.34		χ^2 =92.04, P<0.001	

Table 6: Correlation Among Nurse-Patient Ratio, Patient Acuity, Dependency, Perceived Nurses' Workload, Work Environment Satisfaction, and Length of Stay

Variable	1	2	3	4	5
1. Nurse -Patient Ratio	1				
2. Average Patient Acuity	-0.09	1			
3. Average Patient Dependency	0-.15*	0.87**	1		
4. Perceived Nurse Workload	0.07	0.76**	0.73**	1	
5. Work Environment Satisfaction	-0.28**	-0.31**	-0.29**	-0.38**	1
6. LOS	-0.13	0.12	0.05	0.05	-0.04

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

Table 7: T-Tests for Nurse-Patient Ratio, Patient Acuity, Dependency, Perceived Nurses' Workload, Work Environment Satisfaction, and Patients' Outcomes (7-Day Readmission and Thirty-Day Mortality)

Variable	Outcome	Group 1 Mean No (n = 181)/ Alive (n = 177)	SD	Group 2 Mean Yes (n = 18)/ Died (n = 22)	SD	t	p
Nurse-Patient Ratio	7-Day Readmission	2.09	1.26	2.81	1.59	-2.25	**.03**
	30-Day Mortality	2.25	1.34	1.37	0.50	5.98	**.000**
Patient Acuity	7-Day Readmission	2.58	0.97	2.56	1.04	0.10	.91
	30-Day Mortality	2.57	0.99	2.64	0.90	-0.29	.76
Patient Dependency	7-Day Readmission	2.63	0.98	2.39	1.29	0.77	.45
	30-Day Mortality	2.59	1.04	2.77	0.81	-0.97	.33
Workload Perception	7-Day Readmission	2.34	0.81	2.44	0.98	-0.50	.61
	30-Day Mortality	2.34	0.84	2.41	0.67	-0.34	.72
Work Environment Satisfaction	7-Day Readmission	3.23	0.68	3.17	0.71	0.38	.70
	30-Day Mortality	3.21	0.70	3.36	0.49	-1.31	.19

*Group 1 = No readmission / Alive, Group 2 = Yes readmission / Died

*Seven-day readmission groups: No (n = 181), Yes (n = 18)

*Thirty-day mortality groups: Alive (n = 177), Died (n = 22)

DISCUSSION

The study investigated the relationship between nurse-patient ratios, workload perception, work environment satisfaction, nurse performance, and patient outcomes. Following the Donabedian Model, the results indicated that factors like nurse staffing and work environment are related to the processes of nursing performance and some patient outcomes.

The findings showed significant differences in nurse-patient ratios across hospital departments. Medical-surgical units had the highest staffing burden. These differences may reflect variations in patient care needs and staffing practices between departments. ICUs usually have lower nurse-patient ratios because critically ill patients need constant monitoring and complex treatments. In contrast, medical-surgical nurses often handle larger patient assignments. This can raise their workload and limit their ability to provide

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

thorough patient care. Similar results were noted by Elabasy et al. (2024) and Sharma and Rani (2020). They found that having more patients assigned led to increased workloads and lower care quality.

Higher nurse-patient ratios are correlated with lower satisfaction with the work environment and lower performance in various nursing areas, such as assessment, implementation, documentation, professionalism, and patient education. Overall, these results suggest that not having enough staff can weaken nurses' ability to provide quality and patient-focused care. Similar results were found by Maghsoud et al. (2022), who noted that heavy workloads and insufficient staffing were related to a decline in nursing care quality. These results support the evidence that having enough staff is a key factor in healthcare quality and patient safety.

Perceived workload was also negatively correlated with communication, assessment, diagnosis, and implementation of care. A high perceived workload can cause fatigue, emotional depletion, and cognitive overload, and can impair concentration to an extent where the performance of high-level clinical tasks becomes difficult for the nurse. Similar findings were suggested by Maghsoud et al. (2022) , and Mabona et al. (2022) that "workload negatively affects nurses' effectiveness and increases their occupational stress." Thus, perceived workload may be one important mechanism by which understaffing negatively impacts the performance of nursing.

The dependency level of the patients was found to be negatively correlated with the implementation of care. This implies that those who are more dependent require more nursing care and clinical time. Lee et al. (2023) noted that those who are more dependent have more care needs and present with a worse prognosis. Juvé-Udina et al. (2020) suggested that the dependency and deterioration of the patients should be monitored to staff the unit appropriately, while assuring the safety of the patients. This finding has implications for staffing systems to be based on acuity and dependency level rather than static staff ratios.

Work environment satisfaction was inversely related to nurse-patient ratio, patient acuity, patient dependency, and workload perception. These findings suggest that poor staffing ratios and workloads contribute negatively to work environment satisfaction. On the other hand, there was a positive correlation between work environment satisfaction and implementation of care. Similar findings were found by Galanis et al. (2023), who established that poor work environments lead to job dissatisfaction, high turnover, and lower quality of care. Additionally, a positive correlation was reported between work environment and job satisfaction and performance (Abd Elnaby et al., 2023).

Concerning patient outcomes, a higher nurse-patient ratio was correlated with increased seven-day readmissions. Short staffing could have contributed to impaired quality of discharge preparation, patient education, coordination, and continuity of care, resulting in higher readmission rates. Donabedian suggested that this could explain the results of Dall'Ora et al. (2022); Morioka et al. (2026), which provided evidence that staffing shortfall could compromise patient safety and continuity of care.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

However, it is worthwhile to note that lower nurse-patient ratios were found to be associated with increased mortality risk. This contradicts the previous studies, which reported that a higher nurse-patient ratio correlates with increased mortality risk (Griffiths et al., 2024; Lasater, Aiken, et al., 2021); however, this disparity could be attributed to varying patient acuity across the departments. Critically ill patients admitted into the ICUs have a lower nurse-patient ratio, as this indicates a higher severity of illness and complex conditions; and the mortality risk associated with these critically ill patients cannot be explained by the quality of care or nurse staffing levels alone. Mortality can thus be affected by the patient's severity and departmental case mix.

Despite the lack of direct relationships between patient acuity, dependence, job satisfaction, workload perceptions, and patient outcomes, this finding should not be interpreted as meaning these variables do not have clinical importance. They could have an indirect impact on patient outcomes by influencing nurse performance and processes of care. Griffiths et al. (2024), suggested that staffing and organization variables might have only indirect effects on patient outcomes via the process of care. This interpretation is quite consistent with the Donabedian model, where the quality of care is a relationship between structures, processes of care, and outcomes.

The findings of the present study represent a useful contribution to the evidence related to the adequacy of staffing, work overload, and work environments of nurses in Egyptian hospitals. While much research has been undertaken in high-income countries, the current findings represent the real conditions within healthcare settings marked by resource shortage, nursing workforce shortages, and the unpredictability in hospital organization. The findings highlight the importance of optimizing staffing allocation and improving work environments to support nurse performance and healthcare quality.

CONCLUSION

The findings of the current study showed that the nurse-patient ratio is a significant structural factor that is related to workload perception, satisfaction with work environment, nurse performance, and certain patient outcomes. Increased nurse-patient ratio correlates with decreased nurse performance in several domains of nursing care, with increased readmission rates, while increased workload perception and satisfaction with work environment correlated with decreased nurse effectiveness.

Workload perception, patient acuteness, patient dependence, and work environment satisfaction did not appear to be directly related to outcomes yet may influence them indirectly via the process of care and through nurse performance.

Following the Donabedian model framework, the present work underlines the interrelationship of structure, nursing care, and patient outcome in relation to nurse staffing and work environment. It adds to the existing body of evidence that staffing and work environment factors impact nurse performance and health care quality in low-resource health care settings.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

Limitations

There are some limitations that need to be considered when interpreting the results of the current study. Firstly, the findings might not be generalizable to other healthcare settings due to the reliance on convenience sampling. Secondly, the cross-sectional design prevents causality from being drawn between the variables of the study. Thirdly, the data were collected from one hospital and may not adequately represent the health institutions in Egypt. Furthermore, the use of self-administered instruments may have resulted in higher chances for response bias. Mortality results should be interpreted with some reservation since both acuity and case complexity of the department can serve as confounding factors. Longitudinal and multi-center design with larger samples of representatives is recommended in future studies to explore the causal relationship between staffing adequacy, perceived workload, work environment satisfaction, nurse performance, and patient outcomes.

Recommendations

In the Egyptian context, healthcare policymakers and hospital administrators should adopt evidence-based staffing practices that determine adequate nurse-patient ratios based on patient acuity, dependency, and workload in medical-surgical units and other hospital settings. They should use acuity-based staffing tools and establish a system to monitor workloads on a regular basis to ensure proper staffing allocation and workforce planning. Organizational interventions are also needed to enhance the quality of the work environment through leadership practices, professional development, workload management, and psychological support services. National policy on staffing should also adopt a structured staffing framework, and retention approaches analogous to workload-based staffing international models for nurse retention, patient safety, and health quality within Egyptian hospitals.

References

1) Abd Elnaby, W. T., Abdelrahman, S. M., & Fahmy, A. M. (2023). Relationship between hospital work environment and nurses' performance in critical setting. *Minia Scientific Nursing Journal, 014*(2), 85-91. https://doi.org/10.21608/msnj.2023.244395.1086

2) Ahmed, A., Elrhmaan, S., Mohamed, E., & Ali, H. (2023, 12/30). Factors Affecting on Nursing Shortage and its Relation to Organizational Commitment at Matai General Central Hospital. *Minia Scientific Nursing Journal, 013*, 17-25. https://doi.org/10.21608/msnj.2023.212395.1061

3) Al-Sawy, M. M. R. (2024). Unravelling the Impact of Psychological Burnout and Compassion Fatigue on Turnover Intentions among Nursing Staff in Egypt's Governmental Sector: A Mediation Study. *The Scientific Journal for Financial and Commercial Studies and Research, 5*(1), 305-343. Al-Sawy 2024 Website: https://cfdj.journals.ekb.eg

4) Arruum, D., Yulia, S., Muliyadi, M., & Asiah, N. (2024, 01/04). The Identifying Factors Affecting Nursing Workload: A Literature Review. *Jurnal Keperawatan Priority, 7*, 10-22. https://doi.org/10.34012/jukep.v7i1.4548

5) Bae, S.-H. (2024, 04/30). Nurse Staffing, Work Hours, Mandatory Overtime, and Turnover in Acute Care Hospitals Affect Nurse Job Satisfaction, Intent to Leave, and Burnout: A Cross-Sectional Study. *International journal of public health, 69*, 1607068. https://doi.org/10.3389/ijph.2024.1607068

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

6) Batiha, A. M. (2025, Aug). Evaluating nurse-to-patient ratio legislation to improve patient safety and care quality: A mixed-methods policy study. *Appl Nurs Res, 84*, 151989. https://doi.org/10.1016/j.apnr.2025.151989

7) Chen, Y. C., Guo, Y. L., Chin, W. S., Cheng, N. Y., Ho, J. J., & Shiao, J. S. (2019, Nov 29). Patient-Nurse Ratio is Related to Nurses' Intention to Leave Their Job through Mediating Factors of Burnout and Job Dissatisfaction. *Int J Environ Res Public Health, 16*(23). 76Uhttps://doi.org/10.3390/ijerph16234801

8) Cobb, J. (2008). Registered nurse-performance evaluation. *Retrieved Apr, 30*(2008), 3-23. https://doi.org/10.12691/ajnr-6-4-7.

9) Curley, M. A. (2014). *Synergy: The unique relationship between nurses and patients*. Sigma Theta Tau International. American Association of Critical-Care Nurses. Indianapolis.

10) Dall'Ora, C., Saville, C., Rubbo, B., Turner, L., Jones, J., & Griffiths, P. (2022, Oct). Nurse staffing levels and patient outcomes: A systematic review of longitudinal studies. *Int J Nurs Stud, 134*, 104311. https://doi.org/10.1016/j.ijnurstu.2022.104311

11) Donley, J. (2021, Dec). The Impact of Work Environment on Job Satisfaction: Pre-COVID Research to Inform the Future. *Nurse Lead, 19*(6), 585-589. https://doi.org/10.1016/j.mnl.2021.08.009

12) El-Ghabor, G. (2014). The effect of work stress management training for head nurses on their job performance. *Unpublished Doctorate Thesis. Port Said Faculty of Nursing, Port Said University, Egypt*.

13) El-Sobky, A., & Aladdin, M. (2024). From reform to excellence: the future of health care in Egypt. *The Lancet Global Health, 12*(10), e1584-e1585. https://doi.org/10.1016/S2214-109X(24)00310-3

14) Elabasy, H. A. R., Obied, H. K., & Mahmoud, S. A. (2024). Relation between Nurses- Patients Ratio and Nursing Outcomes at Intensive Care Units. *Tanta Scientific Nursing Journal, 33*(2), -. https://doi.org/10.21608/tsnj.2024.367922

15) Evans, K. K., Bekeny, J. C., Zolper, E. G., Steinberg, J. S., Atves, J. N., Benedict, C. D., Fan, K. L., Akbari, C. M., & Attinger, C. E. (2023, Mar-Apr). Ensuring Quality Care in the COVID-19 Era: Applying the Donabedian Model to Tertiary Wound Care Center Practices. *J Am Podiatr Med Assoc, 113*(2). https://doi.org/10.7547/20-080

16) Galanis, P., Moisoglou, I., Katsiroumpa, A., Vraka, I., Siskou, O., Konstantakopoulou, O., Meimeti, E., & Kaitelidou, D. (2023). Increased job burnout and reduced job satisfaction for nurses compared to other healthcare workers after the COVID-19 pandemic. *Nursing Reports, 13*(3), 1090-1100. https://doi.org/10.3390/nursrep13030095

17) Galiano, M. A., Moreno Fergusson, M. E., Guerrero, W. J., Muñóz, M. F., Ortiz Basto, G. A., Cardenas Ramírez, J. S., Guevara Lozano, M., & Larraín Sundt, A. (2023). Technological innovation for workload allocation in nursing care management: an integrative review. *F1000Res, 12*, 104. https://doi.org/10.12688/f1000research.125421.2

18) Griffiths, P., Saville, C., Ball, J., Culliford, D., Jones, J., Lambert, F., Meredith, P., Rubbo, B., Turner, L., Dall'ora, C., & Group, W. H. O. S. (2024). Nursing Team Composition and Mortality Following Acute Hospital Admission. *JAMA Network Open, 7*(8), e2428769-e2428769. https://doi.org/10.1001/jamanetworkopen.2024.28769

19) Havaei, F., & MacPhee, M. (2020). The impact of heavy nurse workload and patient/family complaints on workplace violence: An application of human factors framework. *Nursing open, 7*(3), 731-741. https://doi.org/10.1002/nop2.444.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

20) Imam, A., Obiesie, S., Aluvaala, J., Maina, J. M., Gathara, D., & English, M. (2022, Oct 12). Identifying gaps in global evidence for nurse staffing and patient care outcomes research in low/middle-income countries: an umbrella review. *BMJ Open, 12*(10), e064050. https://doi.org/10.1136/bmjopen-2022-064050

21) Jin, H., Yao, J., Xiao, Z., Qu, Q., & Fu, Q. (2023). Effects of nursing workload on medication administration errors: a quantitative study. *Work, 74*(1), 247-254. https://doi.org/210.3233/WOR-211392.

22) Juvé-Udina, M. E., González-Samartino, M., López-Jiménez, M. M., Planas-Canals, M., Rodríguez-Fernández, H., Batuecas Duelt, I. J., Tapia-Pérez, M., Pons Prats, M., Jiménez-Martínez, E., Barberà Llorca, M., Asensio-Flores, S., Berbis-Morelló, C., Zuriguel-Pérez, E., Delgado-Hito, P., Rey Luque, Ó., Zabalegui, A., Fabrellas, N., & Adamuz, J. (2020, Nov). Acuity, nurse staffing and workforce, missed care and patient outcomes: A cluster-unit-level descriptive comparison. *J Nurs Manag, 28*(8), 2216-2229. https://doi.org/10.1111/jonm.13040

23) Kurniawati, F., Fikaris, M. F., Eryani, I. S., Rohendi, A., & Wahyudi, B. (2023). The effect of workload, burnout, and work motivation on nurse performance. *Jurnal Aplikasi Manajemen, 21*(4), 915-927. https://doi.org/https://doi.org/10.21776/ub.jam.2023.021.04.05

24) Lasater, K. B., Aiken, L. H., Sloane, D. M., French, R., Martin, B., Reneau, K., Alexander, M., & McHugh, M. D. (2021, Aug). Chronic hospital nurse understaffing meets COVID-19: an observational study. *BMJ Qual Saf, 30*(8), 639-647. https://doi.org/10.1136/bmjqs-2020-011512

25) Lasater, K. B., Sloane, D. M., McHugh, M. D., Cimiotti, J. P., Riman, K. A., Martin, B., Alexander, M., & Aiken, L. H. (2021, Jul). Evaluation of hospital nurse-to-patient staffing ratios and sepsis bundles on patient outcomes. *Am J Infect Control, 49*(7), 868-873. https://doi.org/10.1016/j.ajic.2020.12.002

26) Lee, H., Lee, K., & Lee, S. H. (2023). Association of nursing hours with cognitive function, balance, and dependency level of stroke patients. *Nursing open, 10*(3), 1735-1743. https://doi.org/10.1002/nop2.1430

27) Leiter, M. P., & Maslach, C. (2024). Job burnout. In *Handbook of occupational health psychology, 3rd ed.* (pp. 291-307). American Psychological Association. doi: 10.1037/0000331-015.

28) Mabona, J. F., van Rooyen, D. R., & ten Ham-Baloyi, W. (2022). Best practice recommendations for healthy work environments for nurses: An integrative literature review. *Health SA Gesondheid, 27*(1). https://doi.org/10.4102/hsag.v27i0.1788

29) MacPhee, M., Dahinten, V. S., & Havaei, F. (2017). The impact of heavy perceived nurse workloads on patient and nurse outcomes. *Administrative Sciences, 7*(1), 7. https://doi.org/org/10.3390/admsci7010007

30) Maghsoud, F., Rezaei, M., Asgarian, F. S., & Rassouli, M. (2022). Workload and quality of nursing care: the mediating role of implicit rationing of nursing care, job satisfaction and emotional exhaustion by using structural equations modeling approach. *BMC Nursing, 21*(1), 273. https://doi.org/10.1186/s12912-022-01055-1

31) Martins, T., Musy, S. N., & Simon, M. (2025). Nurse shift patterns, staffing and their association with perceived workload: Sequence analysis of multicentre data. *International Journal of Nursing Studies Advances*, 100420. https://doi.org/https://doi.org/10.1016/j.ijnsa.2025.100420

32) Mohamed, H. A., & Gaballah, S. (2018). Study of the relationship between organizational climate and nurses' performance: A University Hospital Case. *American Journal of Nursing Research, 6*(4), 191-197. https://doi.org/10.12691/ajnr-6-4-7

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 59 Issue: 05:2026
DOI: 10.5281/zenodo.20249375

33) Morioka, N., Moriwaki, M., Miyawaki, A., Saville, C., Fushimi, K., & Griffiths, P. (2026). Hospital Nurse Understaffing and Patient Mortality, Readmission, and Length of Stay. *JAMA Network Open, 9*(2), e2558235-e2558235. https://doi.org/10.1001/jamanetworkopen.2025.58235

34) Naguib, S. A., Al-Hamid, M. A., & Zayed, M. (2021). Health care reform as perceived by nursing staff in selected hospitals. *Egyptian Nursing Journal, 18*(2), 69-75. https://doi.org/10.4103/enj.enj_24_21

35) Patrician, P. A., Campbell, C. M., Javed, M., Williams, K. M., Foots, L., Hamilton, W. M., House, S., & Swiger, P. A. (2024, Jul-Aug 01). Quality and Safety in Nursing: Recommendations From a Systematic Review. *J Healthc Qual, 46*(4), 203-219. https://doi.org/10.1097/jhq.0000000000000430

36) Pryor, S., Hanson, A., Chan, J., Brunner, H., Letourneau, R., & Menon, U. (2024). Nurse Well-Being and Patient-Specific Outcomes: A Scoping Review. *Journal of Nursing Care Quality*, 10.1097. https://doi.org/10.1097/NCQ.0000000000000776

37) Ross, P., Howard, B., Ilic, D., Watterson, J., & Hodgson, C. L. (2023). Nursing workload and patient-focused outcomes in intensive care: A systematic review. *Nursing & health sciences, 25*(4), 497-515. https://doi.org/https://doi.org/10.1111/nhs.13052Digital

38) Sharma, S. K., & Rani, R. (2020, Jun). Nurse-to-patient ratio and nurse staffing norms for hospitals in India: A critical analysis of national benchmarks. *J Family Med Prim Care, 9*(6), 2631-2637. https://doi.org/10.4103/jfmpc.jfmpc_248_20

39) Shields, M. (2006). *Findings from the 2005 National Survey of the Work and Health of Nurses: Enquête nationale sur le travail et la santé du personnel infirmier de 2005, résultats*. Canadian Electronic Library. Canada. Retrieved from https://coilink.org/20.500.12592/h7dhb1 on 12 Dec 2024. COI: 20.500.12592/h7dhb1. https://doi.org/doi:10.1016/j.survophthal.2004.12.008

40) Song, Y., Zhang, X., Luo, D., Shi, J., Zang, Q., Wang, Y., Yin, H., Xu, G., & Bai, Y. (2024). Predicting nursing workload in digestive wards based on machine learning: A prospective study. *BMC Nursing, 23*(1), 908. https://doi.org/https://doi.org/10.1186/s12912-024-02570-z

41) Twigg, D. E., Whitehead, L., Doleman, G., & El-Zaemey, S. (2021, Dec). The impact of nurse staffing methodologies on nurse and patient outcomes: A systematic review. *J Adv Nurs, 77*(12), 4599-4611. https://doi.org/10.1111/jan.14909