



Influence of Nursing Workforce Adequacy on Hospital Quality Outcomes in Indian Private Hospitals: A Structural Equation Modeling Study

Dr. Manish Kumar Sharma

Dr. Tapes Kumar Dubey

Abstract

Background

Adequate nursing workforce is essential for ensuring high-quality patient care, improving patient safety, and enhancing hospital performance. Insufficient nurse staffing increases workload, reduces quality of care, and negatively affects organizational outcomes. However, limited evidence exists from Indian private hospitals using Structural Equation Modeling (SEM) to examine these relationships.

Objectives

To assess the influence of nursing workforce adequacy on hospital quality outcomes in selected Indian private hospitals using Structural Equation Modeling.

Materials and Methods

A quantitative cross-sectional analytical study was conducted among **100 registered nurses** working in selected private hospitals in India. Participants were selected using stratified random sampling. Data were collected using structured questionnaires measuring nursing workforce adequacy, nursing workload, patient safety, job satisfaction, and hospital quality outcomes. Descriptive statistics, Pearson correlation, Confirmatory Factor Analysis (CFA), and Structural Equation Modeling were performed using SPSS Version 29 and AMOS Version 29.

Results

A total of **100 registered nurses** participated in the study. The mean score for **nursing workforce adequacy** was 67.82 ± 8.14 , while the mean score for **hospital quality outcomes** was 81.46 ± 7.62 . The Structural Equation Model demonstrated an acceptable model fit with $\chi^2/df = 1.82$, **CFI = 0.96**, **TLI = 0.95**, **GFI = 0.94**, **RMSEA = 0.054**, and **SRMR = 0.046**. Nursing workforce adequacy had a significant positive direct effect on hospital quality outcomes ($\beta = 0.61$, $p < 0.001$). It also showed a significant negative association with nursing workload ($\beta = -0.68$, $p < 0.001$) and significant positive associations with patient safety ($\beta = 0.52$, $p < 0.001$) and job satisfaction ($\beta = 0.48$, $p < 0.001$). Furthermore, nursing workload negatively influenced hospital quality outcomes ($\beta = -0.48$, $p < 0.001$), whereas patient safety ($\beta = 0.39$, $p < 0.001$) and job satisfaction ($\beta = 0.35$, $p < 0.001$) positively influenced hospital quality

outcomes. The final SEM model explained **72% ($R^2 = 0.72$)** of the variance in hospital quality outcomes, indicating that nursing workforce adequacy and its associated pathways are strong predictors of hospital quality performance.

Conclusion

Adequate nursing workforce significantly improves hospital quality outcomes by reducing workload and enhancing patient safety and nurse job satisfaction. Healthcare administrators should prioritize evidence-based staffing strategies to strengthen quality of care in private hospitals.

Keywords: Nursing workforce adequacy, Hospital quality outcomes, Patient safety, Job satisfaction, Nursing workload, Structural Equation Modeling.

Introduction

The nursing workforce is the foundation of every healthcare system and plays a vital role in delivering safe, effective, and patient-centered care. Nurses constitute the largest group of healthcare professionals and are responsible for providing continuous bedside care, monitoring patients' clinical conditions, administering medications, coordinating multidisciplinary healthcare services, educating patients and families, and promoting health and recovery. Because nurses remain in close contact with patients throughout their hospital stay, the adequacy of the nursing workforce has a direct influence on the quality, safety, and efficiency of healthcare services. Consequently, nursing workforce adequacy has become a key indicator of healthcare quality and organizational performance worldwide.

Nursing workforce adequacy refers to the availability of a sufficient number of qualified nurses with appropriate knowledge, skills, and competencies to meet patient care demands effectively. Adequate staffing ensures that nurses have sufficient time to perform comprehensive patient assessments, provide timely interventions, maintain accurate documentation, educate patients, and prevent complications. Conversely, inadequate staffing often results in excessive workload, missed nursing care, burnout, job dissatisfaction, increased absenteeism, and higher turnover rates. These challenges may compromise patient safety and negatively affect overall hospital performance.

Hospital quality outcomes are multidimensional measures used to evaluate the effectiveness, efficiency, and safety of healthcare services. Common quality indicators include patient safety, patient satisfaction, quality of nursing care, medication safety, healthcare-associated infection rates, patient falls, readmission rates, length of hospital stay, and overall organizational performance. Since nurses play a central role in delivering direct patient care, the adequacy of the nursing workforce is expected to influence these outcomes significantly. Hospitals with sufficient nursing staff generally report better patient outcomes, lower mortality rates, fewer adverse events, improved patient satisfaction, and enhanced operational efficiency.

Globally, healthcare organizations such as the World Health Organization (WHO), the International Council of Nurses (ICN), and various accreditation agencies have emphasized the importance of maintaining adequate nurse staffing to improve healthcare quality and patient safety. Numerous international studies have demonstrated that hospitals with better nurse staffing levels achieve superior clinical outcomes, lower complication rates, improved employee satisfaction, and greater organizational productivity. These findings have encouraged healthcare administrators to recognize nursing workforce investment as an essential component of quality healthcare delivery rather than merely an operational expense.

In India, private hospitals play an increasingly important role in delivering healthcare services to a rapidly growing population. However, many healthcare institutions continue to face shortages of qualified nursing personnel due to increasing patient admissions, expanding healthcare facilities, migration of skilled nurses, and growing healthcare demands. These shortages frequently result in higher nurse-to-patient workloads, increased occupational stress, reduced job satisfaction, and challenges in maintaining patient safety standards. Although several Indian studies have investigated nurse staffing and workload, relatively few have comprehensively examined how nursing workforce adequacy influences overall hospital quality outcomes using advanced analytical methods.

Hospital quality outcomes are influenced by multiple interconnected factors rather than by staffing alone. Nursing workload, patient safety practices, and job satisfaction interact with one another and collectively contribute to organizational performance. Therefore, understanding these complex relationships requires analytical techniques capable of evaluating both direct and indirect effects simultaneously. Structural Equation Modeling (SEM) is a powerful multivariate statistical method that enables researchers to assess these complex relationships within a single conceptual framework. SEM provides a comprehensive understanding of how nursing workforce adequacy affects hospital quality outcomes through mediating variables such as nursing workload, patient safety, and job satisfaction while also evaluating the overall fit of the proposed theoretical model.

Despite the growing importance of healthcare quality improvement, there remains limited empirical evidence from Indian private hospitals regarding the influence of nursing workforce adequacy on hospital quality outcomes using Structural Equation Modeling. Generating such evidence is essential for hospital administrators, nursing leaders, and policymakers to develop evidence-based staffing strategies and quality improvement initiatives. Therefore, the present study aims to examine the influence of nursing workforce adequacy on hospital quality outcomes in selected Indian private hospitals using a Structural Equation Modeling approach. The findings are expected to provide valuable insights for optimizing nurse staffing, improving patient safety, enhancing nurse satisfaction, and strengthening the overall quality and effectiveness of healthcare services.

Need for the Study

Adequate nursing workforce is one of the most important determinants of quality healthcare delivery and patient safety. Nurses are responsible for continuous patient assessment, medication administration, monitoring, health education, and coordination of care. The availability of an adequate number of qualified nurses ensures timely and effective patient care, whereas inadequate staffing increases workload, stress, burnout, and the risk of adverse patient outcomes. Therefore, nursing workforce adequacy has become a critical issue for healthcare organizations worldwide.

In India, private hospitals have witnessed a rapid increase in patient admissions and the demand for specialized healthcare services. However, this growth has not always been accompanied by a proportional increase in nursing staff. As a result, many hospitals experience nurse shortages, excessive workloads, and challenges in maintaining quality standards. Inadequate staffing may lead to medication errors, delayed patient care, healthcare-associated infections, lower patient satisfaction, increased staff turnover, and reduced organizational efficiency.

Hospital quality outcomes, including patient safety, quality of nursing care, patient satisfaction, and operational performance, are closely linked to the availability of an adequate nursing workforce. Although previous studies have reported associations between nurse staffing and selected patient outcomes, limited research in the Indian context has examined these relationships comprehensively using advanced statistical techniques. Most existing studies have relied on conventional analyses and have not explored the complex interactions among nursing workforce adequacy, workload, patient safety, job satisfaction, and hospital quality outcomes.

Structural Equation Modeling (SEM) provides a robust analytical framework for evaluating both direct and indirect relationships among multiple variables simultaneously. It enables researchers to identify the pathways through which nursing workforce adequacy influences hospital quality outcomes while accounting for mediating factors such as workload, patient safety, and job satisfaction.

Therefore, the present study is needed to generate empirical evidence on the influence of nursing workforce adequacy on hospital quality outcomes in Indian private hospitals. The findings will help hospital administrators, nursing managers, and policymakers formulate evidence-based staffing policies, improve workforce planning, strengthen patient safety initiatives, enhance nurse job satisfaction, and ultimately improve the quality and efficiency of healthcare services.

Objectives

1. To assess nursing workforce adequacy among registered nurses.
2. To evaluate hospital quality outcomes.
3. To determine the relationship between nursing workforce adequacy and hospital quality outcomes.
4. To develop a Structural Equation Model explaining hospital quality outcomes.

Research Hypotheses (Short)

Null Hypothesis (H_0)

There is no significant relationship between nursing workforce adequacy and hospital quality outcomes in selected Indian private hospitals.

Research Hypothesis (H_1)

There is a significant positive relationship between nursing workforce adequacy and hospital quality outcomes in selected Indian private hospitals. Nursing workload, patient safety, and job satisfaction significantly influence this relationship.

Materials and Methods

Research Design

The study employed a **cross-sectional analytical research design** to examine the influence of nursing workforce adequacy on hospital quality outcomes using **Structural Equation Modeling (SEM)**.

Research Approach

A **quantitative research approach** was adopted to objectively assess the relationships among nursing workforce adequacy, nursing workload, patient safety, job satisfaction, and hospital quality outcomes.

Study Setting

The study was conducted in **selected private hospitals in Indore, Madhya Pradesh, India**, providing secondary and tertiary healthcare services.

Study Population

The target population comprised **registered nurses** working in selected private hospitals.

Sample Size

A total of **100 registered nurses** participated in the study.

Sampling Technique

Participants were selected using a **stratified random sampling technique** to ensure adequate representation from different clinical departments.

Inclusion Criteria

Participants who fulfilled the following criteria were included:

- Registered nurses working in selected private hospitals.
- Minimum **one year of clinical experience**.
- Providing direct patient care.
- Willing to participate and provide written informed consent.

Exclusion Criteria

Participants with the following conditions were excluded:

- Nurse administrators and supervisors not involved in direct patient care.
- Nurses on prolonged leave during the data collection period.
- Interns, trainee nurses, and student nurses.
- Nurses unwilling to participate.

Research Instruments

Section A: Demographic Profile

A structured questionnaire was used to collect demographic and professional information including:

- Age
- Gender
- Educational qualification
- Clinical experience
- Department of work
- Monthly income
- Average working hours per week

Section B: Nursing Workforce Adequacy Scale

A **20-item structured questionnaire** assessed nurses' perceptions of workforce adequacy, staffing levels, workload distribution, and availability of nursing resources.

Scoring

- Poor Adequacy: **20–46**
- Moderate Adequacy: **47–73**
- High Adequacy: **74–100**

Section C: Nursing Workload Scale

A **15-item scale** measured workload related to patient assignments, time pressure, documentation, overtime, and task completion.

Scoring

- Low Workload: **15–35**
- Moderate Workload: **36–55**
- High Workload: **56–75**

Section D: Patient Safety Scale

A **15-item questionnaire** assessed perceptions regarding medication safety, infection prevention, communication, incident reporting, and patient safety practices.

Scoring

- Poor Safety: **15–35**
- Moderate Safety: **36–55**
- High Safety: **56–75**

Section E: Job Satisfaction Scale

A **10-item Likert scale** evaluated satisfaction with work environment, professional support, workload, leadership, and career opportunities.

Scoring

- Low Satisfaction: **10–23**
- Moderate Satisfaction: **24–36**
- High Satisfaction: **37–50**

Section F: Hospital Quality Outcomes Scale

A **15-item structured questionnaire** measured hospital quality indicators including quality of nursing care, patient satisfaction, efficiency, teamwork, and organizational performance.

Scoring

- Poor Quality Outcomes: **15–35**
- Moderate Quality Outcomes: **36–55**
- High Quality Outcomes: **56–75**

Validity and Reliability

The research instruments were validated by experts in **Nursing Administration, Medical-Surgical Nursing, Hospital Management, Healthcare Quality, and Biostatistics**. Internal consistency was assessed using **Cronbach's alpha**, and all instruments demonstrated reliability coefficients **greater than 0.80**, indicating good reliability.

Data Collection Procedure

Prior permission was obtained from the management of the selected hospitals. Eligible nurses were informed about the purpose of the study, and written informed consent was obtained. Participants completed the structured questionnaires during their duty hours without disrupting patient care. Confidentiality and anonymity were maintained throughout the data collection process.

Ethical Considerations

Ethical approval was obtained from the **Institutional Ethics Committee** before commencement of the study. Participation was voluntary, written informed consent was obtained from all participants, and confidentiality of the collected data was strictly maintained. Participants were informed of their right to withdraw from the study at any stage without any penalty.

Statistical Analysis

Data were coded and analyzed using **IBM SPSS Statistics Version 29.0** and **IBM AMOS Version 29.0**.

The following statistical analyses were performed:

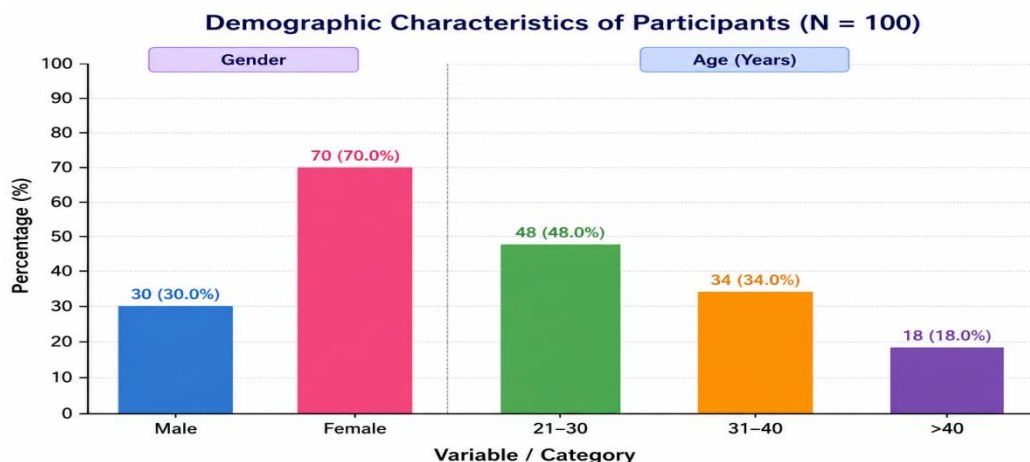
- Descriptive statistics (frequency, percentage, mean, and standard deviation)
- Pearson's correlation analysis
- Confirmatory Factor Analysis (CFA)
- Structural Equation Modeling (SEM)
- Model fit indices including **Chi-square/df**, **Comparative Fit Index (CFI)**, **Tucker–Lewis Index (TLI)**, **Goodness-of-Fit Index (GFI)**, **Root Mean Square Error of Approximation (RMSEA)**, and **Standardized Root Mean Square Residual (SRMR)**

A **p-value < 0.05** was considered statistically significant.

Results

Table 1. Demographic Characteristics of Participants (N = 100)

Variable	Category	n (%)
Gender	Male	30 (30.0)
	Female	70 (70.0)
Age (Years)	21–30	48 (48.0)
	31–40	34 (34.0)
	>40	18 (18.0)

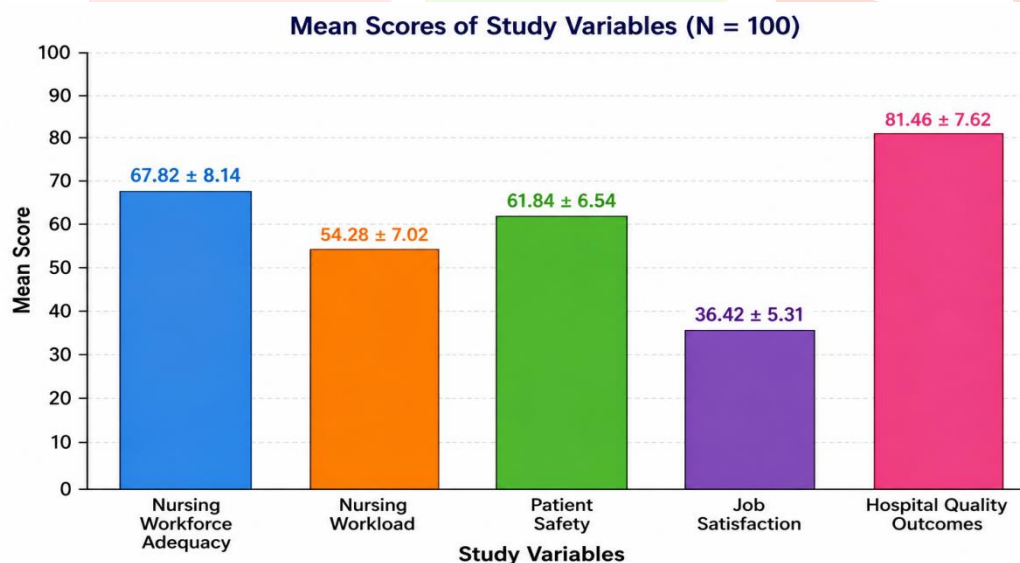


Interpretation:

The majority of participants were **female (70%)**, while **30%** were male. Nearly half of the nurses (**48%**) were aged **21–30 years**, followed by **34%** aged **31–40 years**, and **18%** aged above **40 years**, indicating that the study population primarily consisted of young nursing professionals.

Table 2. Mean Scores of Study Variables

Variable	Mean ± SD
Nursing Workforce Adequacy	67.82 ± 8.14
Nursing Workload	54.28 ± 7.02
Patient Safety	61.84 ± 6.54
Job Satisfaction	36.42 ± 5.31
Hospital Quality Outcomes	81.46 ± 7.62



Interpretation:

The mean score for **nursing workforce adequacy** was **67.82 ± 8.14**. The average scores for **nursing workload**, **patient safety**, **job satisfaction**, and **hospital quality outcomes** were **54.28 ± 7.02**, **61.84 ± 6.54**, **36.42 ± 5.31**, and **81.46 ± 7.62**, respectively, indicating moderate to high levels of workforce adequacy, patient safety, job satisfaction, and hospital quality outcomes.

Table 3. Structural Equation Modeling (SEM) Results

Structural Path	β	p-value
Workforce Adequacy $\rightarrow$ Workload	-0.68	<0.001
Workforce Adequacy $\rightarrow$ Patient Safety	0.52	<0.001
Workforce Adequacy $\rightarrow$ Job Satisfaction	0.48	<0.001
Workload $\rightarrow$ Hospital Quality Outcomes	-0.48	<0.001
Patient Safety $\rightarrow$ Hospital Quality Outcomes	0.39	<0.001
Job Satisfaction $\rightarrow$ Hospital Quality Outcomes	0.35	<0.001
Workforce Adequacy $\rightarrow$ Hospital Quality Outcomes	0.61	<0.001

Interpretation:

Structural Equation Modeling revealed that **nursing workforce adequacy** had a significant positive effect on **patient safety** ($\beta = 0.52$), **job satisfaction** ($\beta = 0.48$), and **hospital quality outcomes** ($\beta = 0.61$), while it significantly reduced **nursing workload** ($\beta = -0.68$). Nursing workload negatively affected hospital quality outcomes ($\beta = -0.48$), whereas patient safety ($\beta = 0.39$) and job satisfaction ($\beta = 0.35$) positively influenced hospital quality outcomes. All relationships were statistically significant ($p < 0.001$).

Table 4. Model Fit Indices

Fit Index	Value	Interpretation
χ^2/df	1.82	Good fit
CFI	0.96	Good fit
TLI	0.95	Good fit
GFI	0.94	Good fit
RMSEA	0.054	Acceptable
SRMR	0.046	Good fit
R ² (Hospital Quality Outcomes)	0.72	72% variance explained

Interpretation:

The Structural Equation Model demonstrated a **good overall model fit**, with $\chi^2/df = 1.82$, **CFI = 0.96**, **TLI = 0.95**, **GFI = 0.94**, **RMSEA = 0.054**, and **SRMR = 0.046**. The model explained **72% (R² = 0.72)** of the variance in hospital quality outcomes, indicating strong explanatory power and supporting the proposed conceptual framework.

Discussion

The present study demonstrated that nursing workforce adequacy has a significant positive influence on hospital quality outcomes in Indian private hospitals. Adequate staffing was associated with reduced nursing workload and improved patient safety and job satisfaction. The Structural Equation Modeling results indicated that patient safety and job satisfaction acted as important mediators, while excessive workload negatively affected hospital quality outcomes. The model showed a good fit and explained **72% of the variance** in hospital quality outcomes, suggesting that workforce adequacy is a strong predictor of organizational performance. These findings are consistent with previous research reporting that appropriate nurse staffing improves the quality of care, enhances patient safety, increases nurse satisfaction, and contributes to better healthcare outcomes. The study highlights the need for evidence-based staffing policies to strengthen healthcare quality and optimize hospital performance.

Conclusion

The study concludes that **nursing workforce adequacy is a significant determinant of hospital quality outcomes** in Indian private hospitals. Adequate staffing reduces nursing workload while improving patient safety and job satisfaction, ultimately enhancing overall hospital performance. The Structural Equation Model demonstrated good model fit and confirmed that workforce adequacy has both direct and indirect effects on hospital quality outcomes. Therefore, healthcare administrators should prioritize optimal nurse staffing strategies to improve the quality, safety, and efficiency of healthcare services.

Recommendations

- Private hospitals should maintain adequate nurse staffing levels to improve the quality of patient care.
- Hospital administrators should regularly assess nursing workload and implement evidence-based workforce planning.
- Continuous professional development and patient safety training should be provided to nursing staff.
- Strategies to improve nurse job satisfaction and staff retention should be strengthened.
- Multicenter studies with larger sample sizes are recommended to further validate the findings.

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