The Impact Of Nurse Staffing Levels On Patient Outcomes: A Systematic Review Of Recent Evidence

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Abstract

Background: The rationale for this research is the growing body of evidence supporting the critical relationship between nurse staffing levels and patient outcomes in healthcare settings. As evidence of the impact of staffing on patient

safety, quality of care, and overall satisfaction mounts, it is necessary to comprehend the particular nuances within the Saudi Arabian healthcare context. This study aims to close this knowledge gap by examining the relationship between nurse staffing levels and patient outcomes within the unique organizational, cultural, and policy frameworks of Saudi Arabia. The aim of current systematic review is to examine the impact of nurse staffing levels on patents outcomes

Method: A thorough search of databases, including Scopus, PsycINFO, and Web of Science, was conducted in order to categorize relevant research that was published between 2020 and 2024. The inclusion criteria for this research were English-language papers that focused on examining the impact of nurse staffing levels on patents outcomes. The selected studies also have to offer useful information on team dynamics and employ recognized measurement scales. Following an initial screening and quality evaluation, eleven studies were included in the synthesis.

Results: The study database was searched through electronic databases, identifying 2368 records. 15 unique records were assessed for eligibility based on titles and abstracts. After initial screening, 15 studies were selected for full-text assessment. After independent review, 11 studies met criteria and were included in the systematic review. The selected studies were conducted between 2020-2024 and varied in design. The PRISMA flowchart illustrates the selection process. Quality evaluation involves peer-reviewed journals, overall assessment, and quality management. The result suggested that themes

Conclusion: This systematic review examines the impact of nurse staffing levels on patient outcomes in Saudi Arabia, highlighting the importance of sufficient nurses for better outcomes. It emphasizes the role of evidence-based policy initiatives in enhancing nurse staffing levels and patient care quality. However, the review acknowledges limitations such as reliance on observational data and generalizability due to differences in patient demographics, healthcare environments, and cultural contexts. Future research should focus on optimizing nurse staffing, creating supportive work environments, and addressing nursing burnout.

Keywords: Nurse Staffing. Level of Nurses, Patents' Outcome, Systematic Review.

Introduction

The number of nurses on duty at any given moment at a healthcare institution, such as a hospital or clinic, is referred to as nurse staffing levels. This covers certified nursing assistants (CNAs), licensed practical nurses (LPNs), and registered nurses (RNs). A variety of variables, including the facility's size, patient volume, patient acuity, and financial limitations, might affect staffing numbers (Cho et al., 2020).

Sufficient nurse staffing is essential to guarantee patient safety, high-quality treatment, and favourable health results. Patient unhappiness, nursing burnout, and medical mistakes can all be exacerbated by understaffing. On the other hand, excessive personnel can cause resource pressure and inefficiency. By utilizing instruments like workload measuring systems and nurse-to-patient ratios, many healthcare companies keep an eye on and modify staffing numbers in response to patient demands. Regulatory bodies may also set rules or specifications about the number of employees needed in order to support patient safety and high-quality treatment (Harrington et al., 2020).

The study finds a strong correlation between patient mortality in surgical wards, nurse education levels, and staffing levels. Higher levels of education increase patient survival rates, whereas an adequate personnel lowers death rates. The study highlights the need of investing in continuing education and managing nurse staffing to improve patient safety and healthcare quality in medical and surgical settings (Haegdorens et al., 2019).

Health systems incur significant costs due to the expense of inpatient hospital nursing, which accounts for half of the worldwide health workforce. A key component of affordable healthcare is matching patient demand with nurse staffing levels. However, due to financial strains and budgetary restrictions, unregistered staff members who get lesser wages frequently replace registered nurses. This calls into question the role of registered nurses in maintaining safe, effective healthcare,

stopping deterioration, and averting negative consequences (Twigg et al., 2021).

The rate at which nurses quit their jobs within a healthcare facility during a certain time period is known as nursing staffing turnover. The performance of an organization and patient care may be significantly impacted by high turnover rates. Frequent nursing staff turnover can cause problems with continuity of care, worse morale among surviving staff, more work, and lower overall quality of care. (Gandhi, Yu & Grabowski, 2021). Additionally, the costs incurred by healthcare businesses in hiring, onboarding, and training new employees may make turnover a pricey affair. A diverse strategy is needed to address the issue of nurse staffing turnover, which may involve enhancing working conditions, providing competitive pay and benefits, giving chances for professional growth and progress, and creating a positive work environment. Healthcare institutions may encourage patient satisfaction by putting initiatives in place to minimize turnover staff retention, enhance patient outcomes, and improve overall organizational performance (Yakusheva, Rambur & Buerhaus, 2020).

Studies employing regularly acquired data from the healthcare industry have become more prevalent that relate patients to the staffing levels they experience throughout their hospital stay by using patient records and computerized rostering systems. These studies can directly investigate the impact of variation by determining the staffing levels that specific patients were exposed to prior to experiencing the result (Musy et al., 2020).

Methods

Research Objective
The objective of research is to examine the impact of nurse staffing levels on patient outcomes.

Research Question
1. What strategies can healthcare organizations implement to optimize nurse staffing levels and improve patient outcomes while considering resource constraints?
2. How do variations in nurse staffing levels affect patient satisfaction scores and perceptions of quality of care?

3. What is the impact of nurse staffing levels on patient outcomes?

Literature Search Strategy

A comprehensive search strategy was developed to identify relevant studies. Databases such as Scopus, PsycINFO and Web of Science were searched using a combination of keywords related to "Nurse Staffing Level", "Patients Outcomes" and ".The Impact of Nurse Staffing Levels on Patient Outcomes."

Table 1 Syntax Search

Syntax 1	"Nurse Staffing Level" and "Patients Outcomes"
Syntax 2	"The Impact of Nurse Staffing Levels on Patient Outcomes in Saudi Arabia"

Table 2 Statistics from the Data Base

No	Database	Syntax	Year	No of Researches
1	Scopus	Syntax 1		587
		Syntax 2		7
2	Web of Science	Syntax 1	2020 - 2024	964
		Syntax 2		12
3	PsycINFO	Syntax 1		790
		Syntax 2		8

The study utilized Scopus, Web of Science, and PsycINFO databases to identify relevant research publications from 2020-2024. The most significant articles were found in Web of Science 976 and PsycINFO 798 whereas Scopus had 594 demonstrating thoroughness in the scientific search. The total researches were searched as 2368.

Figure 1

DATA SEARCH BASE

	SCOPUS	Web of Science	PsychINFO
Data Search Base	594	976	798
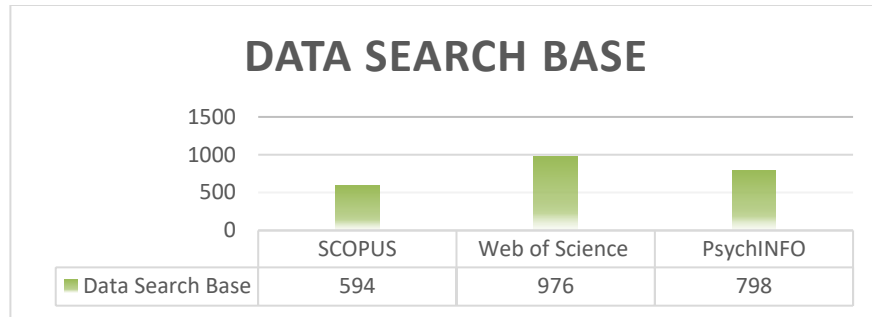
Graphic representation of search database according to different search engines

Inclusion and Exclusion Criteria

The review included studies about exploring the impact of nurse staffing level on patient outcomes published in peer-reviewed journals, conference proceedings, or English-written reports, and was excluded if they did not meet the criteria or was duplicate.

Quality Assessment

The included studies were evaluated for quality and methodological rigor using suitable instruments, such as the Joanna Briggs Institute Critical Appraisal Checklist for different research designs. The evaluation took into account variables including sample size, data gathering techniques, research design, and potential biases. The quality evaluation led to the exclusion of certain studies, but the results were nonetheless interpreted considering the strengths and limits of the respective methods.

Table 3 Assessment of the literature quality matrix

Sr #	Author	Are the selection of studies described appropriately	Is the literature covered all relevant studies	Does the method section describe?	Were findings clearly described?	Quality rating
1	Al Sabei et al. (2021)	Yes	Yes	Yes	Yes	High
2	Alanazi et al. (2023)	Yes	Yes	Yes	Yes	High
3	McHugh et al. (2021)	Yes	Yes	Yes	Yes	High
4	Lasater et al. (2021)	Yes	Yes	Yes	Yes	High
5	Moran et al. (2020)	Yes	Yes	Yes	Yes	High
6	Tenorio et al. (2021)	Yes	Yes	Yes	Yes	High
7	Al Moosa et al. (2020)	Yes	Yes	Yes	Yes	High

Sr #	Author	Are the selection of studies described appropriately	Is the literature covered all relevant studies	Does the method section describe?	Were findings clearly described?	Quality rating
8	Alenezi et al. (2022)	Yes	Yes	Yes	Yes	High
9	Alharbi et al. (2020)	Yes	Yes	Yes	Yes	High
10	Alharbi et al. (2023)	Yes	Yes	Yes	Yes	High
11	Caswell & Kenkre (2021)	Yes	Yes	Yes	Yes	High

The systematic review of studies provided clear descriptions, methods, selection processes, literature coverage, and clear conclusions, resulting in a "High or Good" rating for their quality.

Study   Selection

Two independent reviewers screened retrieved studies for eligibility, then reviewed full-text articles against inclusion and exclusion criteria, with disagreements resolved through discussion or consultation with a third reviewer

Table 4 Selected Studies for SR (Systematic Review

No	Author	Research	Year
1	Al Sabei et al. (2021)	The impact of perceived nurses' work environment, teamness, and staffing levels on nurse-reported adverse patient events in Oman	2021
2	Alanazi et al. (2023)	Safety culture, quality of care, missed care, nurse staffing and their impact on pressure injuries: A cross-sectional multi-source study	2023
3	McHugh et al. (2021)	Effects of nurse-to-patient ratio legislation on nurse staffing and patient mortality, readmissions, and length of stay: a prospective study in a panel of hospitals	2021
4	Lasater et al. (2021)	Evaluation of hospital nurse-to-patient staffing ratios and sepsis bundles on patient outcomes	2021
5	Moran et al. (2020)	Cost-benefit analysis of a support program for nursing staff	2020
6	Tenorio et al. (2021)	The Interrelation between nurse-to-patient ratio, nurse engagement, and missed nursing care in King Saud Medical City: Basis for development of nurse–patient quality of care	2021
7	Al Moosa et al. (2020)	Perception of nurses work environment in tertiary care hospital in Saudi Arabia	2020

No	Author	Research	Year
8	Alenezi et al. (2022)	Confidence, skills and barriers to ostomy patient care by nursing staff in Saudi Arabia	2022
9	Alharbi et al. (2020)	The relationships between nurses' work environments and emotional exhaustion, job satisfaction, and intent to leave among nurses in Saudi Arabia	2020
10	Alharbi et al. (2023)	Patients' satisfaction with nursing care quality and associated factors: A cross-section study	2023
11	Caswell & Kenkre (2021)	Primary healthcare in Saudi Arabia: an evaluation of emergent health trends	2021

Result

Study Database

A systematic search of electronic databases identified 2368 records. After removing duplicates, 11 unique records were assessed for eligibility based on titles and abstracts.

Title and Abstract Screening

The reviewer evaluated the titles and abstracts of the identified records in the first screening. Eleven studies were chosen for full-text review using this procedure. The reviewers' disagreements were settled by consensus and discussion.

Full-Text Assessment

The full texts of the 11 selected studies were found and independently reviewed against the inclusion and exclusion criteria by two reviewers. Following the full-text assessment, 11 studies met the criteria and were involved in the systematic review.
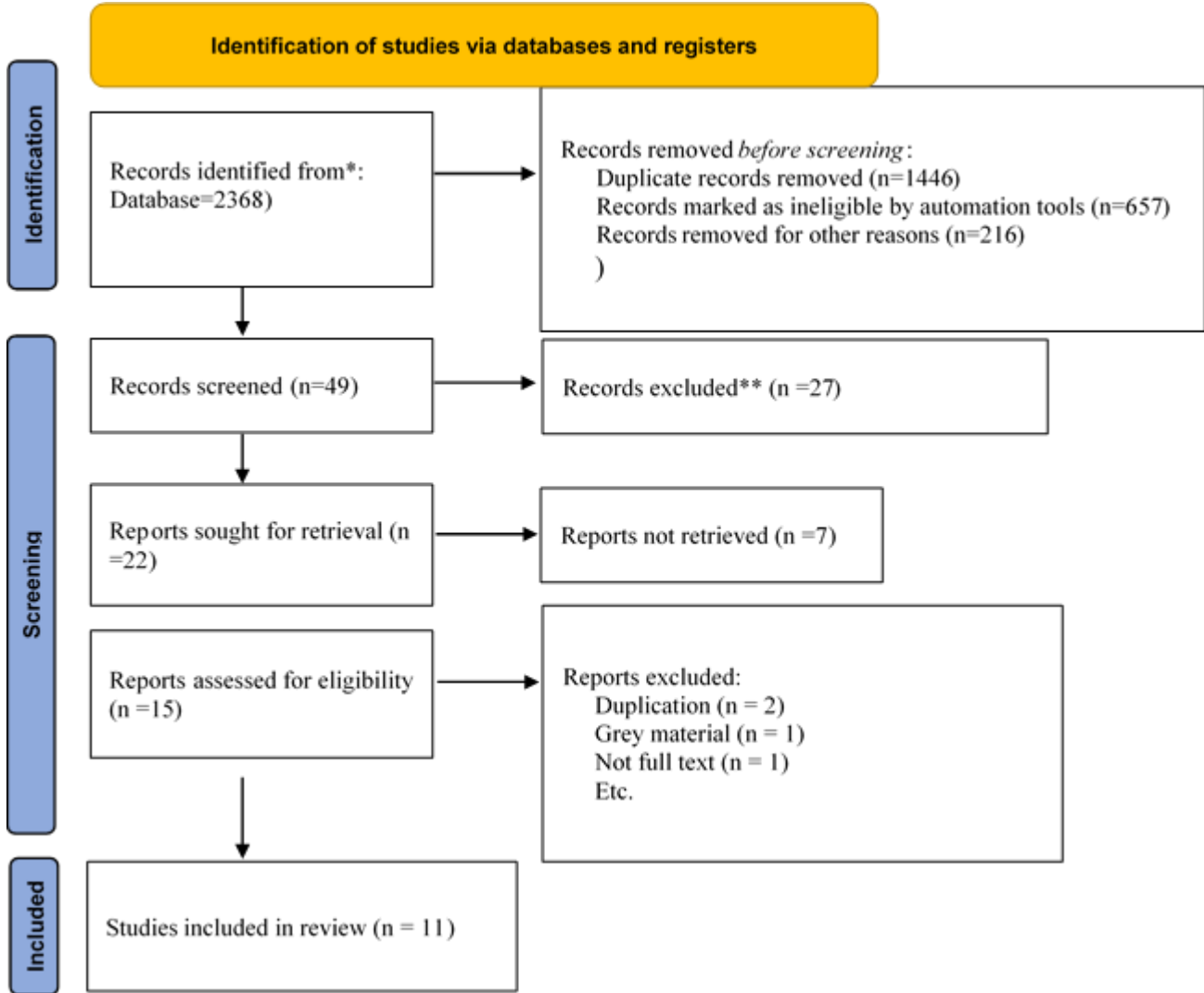
PRISMA Flowchart

The study selection process is illustrated in the PRISMA flowchart (Table 4). It provides a visual representation of the number of records at each stage of the selection process, from initial database search to final inclusion in the systematic review.

Identification of studies via databases and registers

Quality evaluation is a systematic process that includes assessing study quality using data from peer-reviewed journals, largely

assessment, and quality management, providing valuable information on research techniques and pressure application.

Table 5 Identification of Studies via Database

Identification of studies via databases and registers

Records identified from*:
Database=2368)

Records removed *before screening*:
Duplicate records removed (n=1446)
Records marked as ineligible by automation tools (n=657)
Records removed for other reasons (n=216)
)

Records screened (n=49)

Records excluded** (n =27)

Reports sought for retrieval (n =22)

Reports not retrieved (n =7)

Reports assessed for eligibility (n =15)

Reports excluded:
Duplication (n = 2)
Grey material (n = 1)
Not full text (n = 1)
Etc.

Studies included in review (n = 11)

Identification
Screening
Included

Data Extraction

For assessment, a uniform data extraction form was created. Key findings, participant characteristics, research characteristics (authors, publication year), and any other pertinent information were retrieved by two reviewers separately from the selected papers. Consensus was used to settle disagreements.

Table 6 Research Matrix

No	Author, Year	Aim of Study	Methodology	Sample	Setting	Result
1	Al Sabei et al. (2021)	The impact of perceived nurses' work environment, teamness, and staffing levels on nurse-reported adverse patient events in Oman	This study aimed to investigate the impact of perceived nurses' work environment, teamness, and staffing levels on nurse-reported adverse patient events.	Quantitative survey design	Nurses in Oman	Perceived nurses' work environment, teamness, and staffing levels have an impact on nurse-reported adverse patient events in Oman.
2	Alanazi et al. (2023)	Safety culture, quality of care, missed care, nurse staffing and their impact on pressure injuries: A cross-sectional multi-source study	To explore the relationship between safety cultures, quality of care, missed care, nurse staffing, and their impact on pressure injuries.	Cross-sectional study	Multiple healthcare settings	Safety culture, quality of care, missed care, and nurse staffing are associated with pressure injuries.
3	McHugh et al. (2021)	Effects of nurse-to-patient ratio legislation on nurse staffing and patient mortality, readmissions, and length of	To assess the effects of nurse-to-patient ratio legislation on nurse staffing and patient outcomes.	Prospective panel study	Hospitals in the study panel	Nurse-to-patient ratio legislation is associated with changes in nurse staffing levels and patient outcomes

No	Author, Year	Aim of Study	Methodology	Sample	Setting	Result
		stay: a prospective study in a panel of hospitals				including mortality rates, readmissions, and length of stay.
4	Lasater et al. (2021)	Evaluation of hospital nurse-to-patient staffing ratios and sepsis bundles on patient outcomes	This study aimed to evaluate the impact of nurse-to-patient staffing ratios and sepsis bundles on patient outcomes.	Observational study	Hospital wards	Nurse-to-patient staffing ratios and sepsis bundles influence patient outcomes, including sepsis incidence and mortality rates.
5	Moran et al. (2020)	Cost-benefit analysis of a support program for nursing staff	To conduct a cost-benefit analysis of a support program for nursing staff.	Cost-benefit analysis	Nursing staff participating	The support program for nursing staff provides benefits that outweigh its costs, demonstrating its cost-effectiveness.
6	Tenorio et al. (2021)	The Interrelation between nurse-to-patient ratio, nurse engagement, and missed	To examine the interrelation between nurse-to-patient ratio, nurse engagement,	Cross-sectional study	King Saud Medical City	Nurse-to-patient ratio, nurse engagement, and missed nursing care are interconnected factors

No	Author, Year	Aim of Study	Methodology	Sample	Setting	Result
		nursing care in King Saud Medical City: Basis for development of nurse–patient quality of care	and missed nursing care, aiming to develop strategies for improving nurse-patient quality of care.			influencing nurse-patient quality of care.
7	Al Moosa et al. (2020)	Perception of nurses work environment in tertiary care hospital in Saudi Arabia	To explore nurses' perceptions of their work environment in a tertiary care hospital in Saudi Arabia.	Qualitative study	Nurses in a Saudi hospital	Nurses perceive various aspects of their work environment, which may impact their job satisfaction and well-being.
8	Alenezi et al. (2022)	Confidence, skills and barriers to ostomy patient care by nursing staff in Saudi Arabia	To assess nursing staff confidence, skills, and perceived barriers related to ostomy patient care in Saudi Arabia.	Survey and interviews	Nursing staff in Saudi Arabia	Nursing staff in Saudi Arabia have varying levels of confidence and skills in providing ostomy care, with identified barriers affecting care delivery.
9	Alharbi et al. (2020)	The relationships between nurses' work environments and	To investigate the relationships between nurses' work	Cross-sectional survey	Nurses in Saudi Arabia	Nurses' work environments significantly influence emotional exhaustion, job

No	Author, Year	Aim of Study	Methodology	Sample	Setting	Result
		emotional exhaustion, job satisfaction, and intent to leave among nurses in Saudi Arabia	environments and emotional exhaustion, job satisfaction, and intent to leave.			satisfaction, and intent to leave in Saudi Arabia.
	Alharbi et al. (2023)	Patients' satisfaction with nursing care quality and associated factors: A cross-section study	To assess patients' satisfaction with nursing care quality and identify associated factors.	Cross-sectional study	Patients in Saudi Arabia	Patients' satisfaction with nursing care quality is influenced by various factors including communication, empathy, and responsiveness of nursing staff.
11	Caswell & Kenkre (2021)	Primary healthcare in Saudi Arabia: an evaluation of emergent health trends	To evaluate emergent health trends in primary healthcare in Saudi Arabia.	Evaluation study	Primary healthcare in Saudi Arabia	Primary healthcare in Saudi Arabia demonstrates emergent health trends with implications for healthcare delivery and public health initiatives.

Data Synthesis

The synthesized findings were presented through a narrative synthesis approach; to examine the impact of nurse staffing levels on patients' outcomes. Quantitative findings, if available and comparable, may be pooled for meta-analysis. Heterogeneity among studies was assessed using appropriate methods.

Table 7 The following sub-themes have been observed among the studies, including in the systematic review.

Themes	Sub-themes
Staffing Levels	Nurse-to-patient ratio, Nurse engagement, Staffing legislation
Work Environment	Perception of work environment, Safety culture, Teamness
Patient Outcomes	Adverse patient events, Pressure injuries, Patient mortality, Readmissions, Length of stay, Sepsis bundles, Nursing care quality, Patient satisfaction
Nurse Experience	Emotional exhaustion, Job satisfaction, Intent to leave, Confidence and skills, Barriers to care
Healthcare Trends	Primary healthcare evaluation, Emergent health trends

Discussion

A broad range of issues and sub-themes that provide insight into different facets of nurse staffing levels, patient outcomes, and healthcare delivery are covered by the research papers this study looked at. The vital relevance of staffing levels in healthcare settings is one recurring subject in these publications. One of the main sub-themes of this issue is the nurse-to-patient ratio, which has been thoroughly researched in a variety of settings with respect to its effects on adverse events, patient mortality, and overall quality of care. According to McHugh et al. (2021), laws requiring particular nurse-to-patient ratios improved nurse staffing levels and were linked to lower rates of readmissions, patient death, and durations of stay. This emphasizes how important policy changes are to maintaining appropriate staffing levels and improving patient outcomes.

The impact of the work environment on the experiences of nurses and patients is another recurring issue in the literature. Al Sabei et al. (2021) investigated the relationship between unpleasant patient events reported by nurses and perceived work environment characteristics such staffing levels and teamwork. Alharbi et al. (2020) also looked at the connections between the work settings of nurses and their emotional weariness, job satisfaction, and intention to quit. The correlation between the work environment, nurse well-being, and patient safety is underscored by these research, underscoring the necessity for

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healthcare companies to give priority to establishing work environments that are helpful and accommodating.

Numerous papers have a strong emphasis on patient outcomes, with researchers looking into a range of variables that affect the standard and satisfaction of patient treatment. The influence of nurse staffing levels, missed treatment, and safety culture on pressure injuries was examined by Alanazi et al. (2023), emphasizing the complex nature of patient outcomes. Additionally, Alharbi et al. (2023) emphasized the significance of patient-centered care delivery by investigating patients' satisfaction with the quality of nursing care and identifying associated characteristics.

Another important element that comes to light is the influence that nurses' experiences and perspectives have in hospital settings. In their study on Saudi Arabian nursing staff confidence, skill levels, and obstacles to providing ostomy patient care, Alenezi et al. (2022) emphasized the value of ongoing professional development and filling in skill gaps in order to enhance the standard of patient care. Furthermore, Al Moosa et al. (2020) investigated how Saudi Arabian tertiary care hospital nurses perceived their workplace, offering insights into variables that affect nurses' job satisfaction and retention.

Finally, a number of publications discuss healthcare trends and policy ramifications, demonstrating how dynamic the healthcare industry is. Caswell and Kenkre's (2021) assessment of emerging health trends in Saudi Arabian primary healthcare offered insightful information on present obstacles and prospects in the provision of healthcare. Additionally, a cost-benefit analysis of a nursing staff support program was carried out by Moran et al. (2020), emphasizing the financial consequences of funding professional growth and nurse well-being.

Limitation & Implications

The examined papers provide insightful information on the connection between patient outcomes and nurse staffing levels. Nevertheless, they have drawbacks that could make it more difficult to prove causation, such as their reliance on observational data. The findings' generalizability could be restricted by differences in patient demographics, healthcare environments, and

cultural contexts. The apparent impact of staffing levels on patient outcomes may be influenced by factors such as nursing skill mix, experience, and task allocation, although these factors are not usually sufficiently taken into consideration. Biases and errors may be introduced by the use of self-reported metrics and retrospective data gathering techniques. Notwithstanding these drawbacks, the results have significant ramifications for future research, policy, and healthcare practice. Notwithstanding these drawbacks, the results have significant ramifications for future research, policy, and healthcare practice. To enhance staff well-being and patient outcomes, healthcare organizations should place a high priority on nurse staffing optimization, creating supportive work environments, offering chances for professional growth, and addressing nursing burnout. To further understand the intricate link between nurse staffing levels and patient outcomes, longitudinal studies, randomized controlled trials, and multi-site partnerships should be included in future research.

Recommendations

Policymakers should create evidence-based laws and regulations, carry out routine workforce evaluations, fund professional development initiatives, and encourage a work-life balance and well-being culture in order to enhance nurse staffing levels and patient outcomes. Technology and collaborative care models can help to increase communication, streamline the delivery of care, and strengthen multidisciplinary cooperation. Setting patient-centered care approaches as a top priority promotes autonomy and attends to individual needs. It is guided by patient input. To get a deeper knowledge of the connection between patient outcomes and nurse staffing levels, more funding for research and assessment is required. Healthcare organizations and policymakers may improve patient outcomes, staffing levels of nurses, and the provision of high-quality, patient-centered care by putting these ideas into practice.

What this article is adding in existing literature?

This systematic review gathered the researches which examine the impact of nurse staffing levels on patients' outcomes. The paper highlights the paucity of research on this subject in other areas and offers a thorough study of how nurse staffing levels affect patient outcomes in Saudi Arabia. By providing insights into the particular

difficulties and possibilities faced by the Saudi healthcare system, it closes this knowledge gap. The research also takes into account Saudi Arabia-specific organizational, cultural, and policy-related aspects, offering complex findings that might not be found in other areas. The findings are more pertinent and applicable to academics, policymakers, and healthcare practitioners working in Saudi Arabia's healthcare system because to this contextualized approach. The association between nurse staffing levels and patient outcomes in Saudi Arabia is also supported by empirical evidence and data-driven analyses included in the paper, which strengthens the body of evidence supporting the significance of having a suitable number of nurses in the workforce to enhance the quality and safety of patient care. Overall, the study adds to our knowledge of the intricate connection between patient outcomes and nurse staffing levels in the Saudi Arabian healthcare system and has important ramifications for future research, policy, and practice.

Conclusion

This paper examines the impact of Saudi Arabia's nursing staffing levels on patient outcomes, focusing on the country's unique challenges and benefits in the healthcare sector. It provides detailed insights into Saudi Arabia's organizational, cultural, and policy-related aspects, emphasizing the importance of sufficient nurses for better patient outcomes. The study emphasizes the role of evidence-based policy initiatives in enhancing nurse staffing levels and patient care quality. This paper is valuable for healthcare professionals, legislators, and academics.

References

Al Moosa, M., Hassanein, S. E., Alnems, A., Abdrbo, A. A., Minguez, O., & Ghadheeb, F. A. (2020). Perception of nurses work environment in tertiary care hospital in Saudi Arabia. American Journal of Nursing Science, 9(1), 23-29.

Alenezi, A., Kimpton, A., McGrath, I., & Livesay, K. (2022, May). Confidence, skills and barriers to ostomy patient care by nursing staff in Saudi Arabia. In Nursing Forum (Vol. 57, No. 3, pp. 403-411).

Alharbi, A. A., Dahinten, V. S., & MacPhee, M. (2020). The relationships between nurses' work environments and emotional exhaustion, job satisfaction, and intent to leave among nurses in Saudi Arabia. Journal of advanced nursing, 76(11), 3026-3038.

Alharbi, H. F., Alzahrani, N. S., Almarwani, A. M., Asiri, S. A., & Alhowaymel, F. M. (2023). Patients' satisfaction with nursing care quality and associated factors: A cross-section study. Nursing Open, 10(5), 3253-3262.

Alanazi, F. K., Lapkin, S., Molloy, L., & Sim, J. (2023). Safety culture, quality of care, missed care, nurse staffing and their impact on pressure injuries: A cross-sectional multi-source study. International journal of nursing studies advances, 5, 100125.

Alanazi, F. K., Lapkin, S., Molloy, L., & Sim, J. (2023). Safety culture, quality of care, missed care, nurse staffing and their impact on pressure injuries: A cross-sectional multi-source study. International journal of nursing studies advances, 5, 100125.Caswell, A., & Kenkre, J. (2021). Primary healthcare in Saudi Arabia: an evaluation of emergent health trends. Global Journal on Quality and Safety in Healthcare, 4(3), 96-104.

Al Sabei, S. D., AbuAlRub, R., Labrague, L. J., Ali Burney, I., & Al-Rawajfah, O. (2021, October). The impact of perceived nurses' work environment, teamness, and staffing levels on nurse-reported adverse patient events in Oman. In Nursing Forum (Vol. 56, No. 4, pp. 897-904).

Cho, S. H., Lee, J. Y., You, S. J., Song, K. J., & Hong, K. J. (2020). Nurse staffing, nurses prioritization, missed care, quality of nursing care, and nurse outcomes. International Journal of Nursing Practice, 26(1), e12803.Harrington, C., Dellefield, M. E., Halifax, E., Fleming, M. L., & Bakerjian, D. (2020). Appropriate nurse staffing levels for US nursing homes. Health services insights, 13, 1178632920934785.

Gandhi, A., Yu, H., & Grabowski, D. C. (2021). High Nursing Staff Turnover In Nursing Homes Offers Important Quality Information: Study examines high turnover of nursing staff at US nursing homes. Health Affairs, 40(3), 384-391.

Haegdorens, F., Van Bogaert, P., De Meester, K., & Monsieurs, K. G. (2019). The impact of nurse staffing levels and nurse's education on patient mortality in medical and surgical wards: an observational multicentre study. BMC health services research, 19(1), 1-9.

Lasater, K. B., Sloane, D. M., McHugh, M. D., Cimiotti, J. P., Riman, K. A., Martin, B., ... & Aiken, L. H. (2021). Evaluation of hospital nurse-to-patient staffing ratios and sepsis bundles on patient outcomes. American Journal of Infection Control, 49(7), 868-873.

Musy, S. N., Endrich, O., Leichtle, A. B., Griffiths, P., Nakas, C. T., & Simon, M. (2020). Longitudinal study of the variation in patient turnover and patient-to-nurse ratio: descriptive analysis of a Swiss University Hospital. Journal of medical Internet research, 22(4), e15554.

McHugh, M. D., Aiken, L. H., Sloane, D. M., Windsor, C., Douglas, C., & Yates, P. (2021). Effects of nurse-to-patient ratio legislation on

nurse staffing and patient mortality, readmissions, and length of stay: a prospective study in a panel of hospitals. The Lancet, 397(10288), 1905-1913.

Moran, D., Wu, A. W., Connors, C., Chappidi, M. R., Sreedhara, S. K., Selter, J. H., & Padula, W. V. (2020). Cost-benefit analysis of a support program for nursing staff. Journal of Patient Safety, 16(4), e250-e254.

Tenorio, M. R., Aletreby, W. T., Al Shammari, B., Almuabbadi, B., Mwawish, H., & Montegrico, J. (2021). The Interrelation between nurse-to-patient ratio, nurse engagement, and missed nursing care in King Saud Medical City: Basis for development of nurse–patient quality of care. Saudi Journal for Health Sciences, 10(2), 116-124.

Twigg, D. E., Whitehead, L., Doleman, G., & El-Zaemey, S. (2021). The impact of nurse staffing methodologies on nurse and patient outcomes: A systematic review. Journal of Advanced Nursing, 77(12), 4599-4611.

Yakusheva, O., Rambur, B., & Buerhaus, P. I. (2020, August). Value-informed nursing practice can help reset the hospital-nurse relationship. In JAMA Health Forum (Vol. 1, No. 8, pp. e200931-e200931). American Medical Association.