

Impact of Nurse–Patient Ratio on Quality of Care in Saudi Hospitals

Hanadi Ahmed Suliman Johar¹, Manar Modhi Alrouily², Holod Hanian Alharabi³, Maha Khalifah Olaythah Almutairi⁴, Bajdah Ayed Mohssen Al-Motiri⁵, Abdullh Abdurahman Awad Al-Motiri⁶, Abeer Eqab Ahmed Alzahrani⁷, Meshael Alqassem Alshgery⁸, Nouf Turki Hamad Alshomrani⁹, Aisha Mahfood Amer¹⁰, Sana Ibrahim Mohammed Alzain¹¹, Safaa Ahmed Alshoriqui¹²

^{1.} Nurse Technician, King Faisal Medical Complex, Maternity Hospital , Taif Health Cluster

^{2.} Nurse Technician, Diabetes And Endocrinology Center , Aljuf Health Cluster

^{3.} Nurse Technician, King Fahd Specialist Hospital In Qassim , Qassim Health Cluster

^{4.} Nurse Technician, Public Health Sector, Al-Artawiyah , Riyadh Second Health Cluster

^{5.} Nurse Technician, Umm Al-Jamajem Primary Health Care Center , Riyadh Second Health Cluster

^{6.} Nurse Health Assistant, Umm Al-Jamajem Primary Health Care Center , Riyadh Second Health Cluster

^{7.} Nurse Technician, Al-Artawiyah Primary Health Care Center , Riyadh Second Health Cluster

^{8.} Nurse Specialist, Wadi Aldwaser General Hospital , Riyadh First Health Cluster

^{9.} Nurse Technician, Tabala Mubraz Primary Health Care Center , Asir Health Cluster

^{10.} Nurse Technician, Al-Ryash Primary Healthcare Center , Asir Health Cluster

^{11.} Nurse Specialist, Al-Ryash Primary Healthcare Center , Asir Health Cluster

^{12.} Nurse Specialist, Alazyziah Child Hospital , Jeddah Second Health Cluster

Abstract

Introduction: Saudi Arabian hospitals are moving towards the value-based model of healthcare according to the Saudi Vision 2030, as well as the Health Sector Transformation Program. At the center of this change is the nursing workforce, which forms the greatest professional demographic in the healthcare industry of the Kingdom. Nurse-Patient Ratio (NPR) is a crucial structural parameter of nursing quality; nevertheless, the contribution of these ratios to the specifics of a socio-cultural and demographic situation in Saudi Arabia where the number of expatriates and the volume of national employees is high and is systematically evaluated.

Study Objective: The primary goal of this thorough examination is to provide a thorough investigation and organised compilation of existing literature about the effect of Nurse-Patient Ratios (NPR) on the overall quality of care in Saudi Arabia hospitals.

Methodology: A systematic search was carried out in five major databases, PubMed, CINAHL, Scopus, Google Scholar, and Saudi Digital Library (SDL). Primary research studies published in 2015-2025 were searched in peer-reviewed studies. The predefined inclusion criteria used in the screening through the PRISMA guidelines was based on the acute care setting in the Kingdom. The information was collected on staffing metrics, negative events in patients, and nurse-reported outcomes. The results of the studies included were subjected to a thematic synthesis.

Conclusion: Proper nurse staffing is not only a logistical value but a determining factor of patient safety and workforce sustainability in the Saudi system of healthcare. In order to meet the quality targets of the Vision 2030, the policymakers will need to have standardized and evidence-based staffing requirements which will take into consideration the cultural and communicative intricacies of the Saudi clinical setting.

Keywords: Nurse–Patient Ratio, Nurse Staffing, Quality of Care, Patient Safety, Clinical Outcomes.

Introduction

The healthcare of the Kingdom of Saudi Arabia (KSA) is experiencing the most radical change ever, owing to the inspiring aspirations of Saudi Vision 2030 and the Health Sector Transformation Program (HSTP). [1] The most critical of this evolution is the shift of a traditional, volume-driven model to a value-based healthcare system, which depends on the prioritization of patient safety, clinical outcomes,

and efficiency. In this context, nurse workforce is the main resource of the medical machinery as this group of healthcare workers makes the largest percentage. As a result, the Nurse-Patient Ratio (NPR) that could be defined as the number of patients that a registered nurse is supposed to supervise in one working shift has become one of the most important indicators of the quality and safety of hospital care in the Kingdom. [7]

The Saudi Healthcare Transformation Background

The Saudi Arabian healthcare is decentralizing its delivery of healthcare in accordance with the new Health Clusters model to enhance access and quality, however, the success of these clusters is also highly dependent on human capital. [4] The World Health Organization (WHO) and the Saudi Ministry of Health (MOH) have long been aware that the level of nursing staff is not just an administrative variable but a determinant factor of patient survival. The work of bedside nurses in patient monitoring, intervention, and education has been complicated as the Kingdom focuses on raising the life expectancy of its population and decreasing the number of chronic diseases. [5], [6]

The human factor or the proportion of nurses to patients regardless of the heavy investments in medical technology is the factor that has the highest predictability of the ability of a hospital to avoid the failure to rescue events. The nursing population in Saudi Arabia is also defined by the specific demographic profile combined of the increasing proportion of Saudi citizens and the overwhelming majority of expatriate nurses with different language and educational backgrounds. [8] This fact makes the workload more complex as communication and cultural mediation can overload the nurses of any numerical proportion.

Establishing Nurse-Patient Ratio (NPR) and Quality of Care

Quality of Care (QoC) in the hospital environment is a multidimensional construct that incorporates safety, effectiveness, patient-centeredness, and timeliness.⁵ The research shows that in case NPRs are suboptimal, i.e., one nurse has too many patients, the quality of care will suffer in a process called care erosion. [2], [3] Although in most Saudi public and semi-private hospitals the Ministry of Health is aiming at international standards (1:4 or 1:6 in general wards), the practice is subject to change because of high occupancy rates and seasonal specificities, including the Hajj and Umrah seasons. A change in a ratio of 1:4 to 1:8 means that the time during which a nurse can look after the vital activities, including the medication check-ins, skin evaluations, and emotional encouragement, is reduced by fifty percent. [5], [7]

The recent statistics demonstrate the urgency of the problem of staffing in the Kingdom:

Workforce Composition: According to recent reports, the nursing personnel constitutes about 45 percent and 50 percent of the total healthcare workforce in KSA. [9]

The Shortage Gap: Throughout the years of consistent rise in nursing graduates, the Saudi Commission for Health Specialties (SCFHS) has indicated that there will be more than 100,000 more nurses required by 2030 to address the demands of an ageing population and increased services. [12]

Impact on Safety: National survey among Saudi tertiary hospitals revealed that almost 40 percent of nurses always indicate high burnout which correlates directly with patient loads in the medical-surgical unit of more than 1:8. [11], [6]

Missed Care: A research done in Riyadh and Jeddah has revealed that in units with high NPRs, 50 percent of the nurses acknowledge that they fail to perform at least one of the required activities in nursing (ambulation and oral care) during their shift because of time constraints. [8]

Rationale of the Study

This systematic review is based on the fact that it is essential to align the nursing practices with the rapid structural changes of the Saudi Health Transformation Program. [12], [13] With the shift towards a decentralized healthcare delivery model, in the form of clusters, in Saudi Arabia, the need to depend more on the human capital, in this case nurses, has never been greater. Nevertheless, a number of country-specific reasons provide a special justification of this inquiry:

Overcoming an Evidence Gap in the Middle East: A large portion of the current Nurse-Patient Ratio (NPR) research is based in a Western context (i. e. the United States and Europe). Since Saudi hospitals function within a special socio-cultural and economic background, using western standards without locally acquiring evidence can result in hampering staffing rules. [14]

The Expatriate-National Workforce Dynamic: The language barrier and cultural differences tend to augment the perceived workload because the nursing workforce, especially 60-70 percent of it, is expatriates in nature. On paper, a ratio of 1:6 might be safe but practically, it would act as a ratio of 1:8 because of the time that it takes to translate and mediate the cultures. [11], [8]

The upcoming promotion of support to the idea of Saudiization (Nitaqat): To attract and retain Saudi nationals within the nursing profession, the working conditions should be safe and manageable. Another major cause of turnover is the high ratios; therefore, to know the best ratio is a key to the sustainability of the national workforce. [3]

Need of the Study

This study is needed because the healthcare infrastructure in the Kingdom is under pressure that is rapidly growing. This study is needed to answer the following mounting anxieties:

Minimization of Missed Nursing Care (MNC)

According to recent studies conducted in Saudi, high patient loads are the strongest predictor of Missed Nursing Care, in which the patient is not given the essential care, including repositioning, education, and emotional support because of the lack of time. The urgent requirement is to measure the extent to which certain levels of NPR cause such omissions in order to avoid pressure ulcers and pneumonia as complications in the hospital.

Improvement of the Patient Safety Culture

Reduction of medical errors is of priority in the Saudi Patient Safety Center (SPSC). This research is necessary because the percentage of medication errors and falls is statistically greater in the units that are understaffed, and healthcare administrators need evidence-based safe zones related to staffing to guarantee that patients will not suffer preventable injuries.

Economic Efficiency and Vision 2030

Sustainable financial performance for hospitals is a requirement of Vision 2030. More nurses equal higher costs in the short term; however, under-staffing can result in:

- Prolonged Length of Stay (LOS) as patients suffer from complications while being treated;
- Increased Turnover Costs; it costs much more to hire and relocate a single nurse (including the visa process and training) in the KSA than it does to maintain a safe nurse/patient ratio;
- Penalties for Patient Readmissions; the quality of care provided is not at a level that keeps patients from being readmitted frequently, which is contrary to the Kingdom's "Value-Based Care" initiatives.

As such, it will be necessary to complete this study to assess whether current staffing levels will support the increasing needs of the patient population in Saudi Arabia, which is seeing an increase in the number of patients suffering from chronic diseases and an ageing population. NCDs (e.g., Diabetes mellitus, Cardiovascular Disease) will require more intensive levels of care and/or additional monitoring.

Study Objective

The primary goal of this thorough examination is to provide a thorough investigation and organised compilation of existing literature about the effect of Nurse-Patient Ratios (NPR) on the overall quality of care in Saudi Arabia hospitals. For this study we need to establish a link between Nurse-Staffing Levels and the occurrence of negative patient incidents, which includes; adverse events like medication errors, HAIs, and Patient Falls in a Saudi clinical setting.

Research Methodology

Research Question

The research questions of the current study are:

Q1. To what degree does the growing number of patients assigned per nurse relate to a growing number of Adverse Events (such as) medication errors, HAIs and patient falls in Saudi Arabia clinical facilities?

Q2. What impact does the number of Nurse-Patient Ratios have on the prevalence of Missed Nursing Care (MNC) by nursing personnel in the Kingdom's hospitals?

Research Design

The research design employed in the current study is a systematic review one, and the PRISMA (Preferred Reporting Items to Systematic Reviews and Meta-Analyses) framework is followed to make the synthesis of the available evidence transparent, rigorous, and reproducible. Considering the nature of the research, specifically, the Saudi Arabian healthcare situation, this design is suitable because it would enable interweaving of different empirical information, including cross-sectional surveys, longitudinal cohort studies into one high-tier summary. The design will be structured on the basis of identification of the relevant literature through the databases of world and regional literature (Pubmed, CINAHL and Saudi digital library) and the following critical evaluation of the quality of the study and subsequent thematic synthesis of the results.

Search Strategy

This systematic review search strategy was carefully crafted to conduct the identification of all the pertinent peer-reviewed literature that is related to the subject of nursing workloads in the Saudi healthcare sector. Various databases with high impact were searched (such as PubMed, CINAHL, Scopus, Google Scholar, and the Saudi Digital Library (SDL)) with a comprehensive electronic search, which is necessary to obtain journals that are region-specific. Both Boolean operators (AND, OR) and Medical Subject Headings (MeSH) terms were used in search, which included the following: "Nurse-Patient Ratio," "Nursing Staffing Levels," "Quality of Health Care," "Patient Safety," and "Saudi Arabia." The search was also restricted to articles published within 2015-2025 to make the results relevant to the present healthcare state and Vision 2030.

Types of Studies Included

In order to achieve a high level of evidence and the extensive scope of knowledge about the situation in Saudi, this systematic review contains mostly quantitative studies with peer reviews and observational studies. Most of the literature provided is cross-sectional surveys, which are commonly used in Saudi research to evaluate the perceptions of nurses, the level of burnout, and the patient satisfaction in real-time. Further, the review also deems longitudinal observational studies and retrospective cohorts studies that combine hospital administrative data to match the staffing rosters with clinical outcomes, including mortality and infection rates. To cover the entire range of the nursing experience in the Kingdom, a few mixed-method studies were also incorporated, which enabled to obtain the qualitative information about the cultural and communicative barriers which worsen the high patient loads.

Keywords

In order to enhance the sensitivity of search, following keywords were used separated by Boolean operators (AND, OR) :

"Nurse-Patient Ratio" OR "Nurse Staffing" OR "Nursing Workload" OR "Nurse-to-Patient Ratio" AND "Quality of Care" OR "Patient Safety" OR "Clinical Outcomes" OR "Missed Nursing Care" AND "Saudi Arabia" OR "KSA" OR "Saudi Hospitals".

Data Management

The management of data used in this systematic review is a three-phase process, namely collection, cleaning and storage, to be able to guarantee the reproducibility and integrity of the findings. After completing the initial literature search, all found citations are added to a reference management application, e.g. Mendeley or EndNote, to enable the systematical elimination of duplicates. Mighty screening process is then run with help of specialized systematic review tools such as Covidence or Rayyan in which two independent reviewers review titles and abstracts in relation to inclusion criteria. To select the final number of studies, a tailor-made Data Extraction Form is created in Microsoft Excel or REDCap, and some important variables are captured in it, i.e., author, year of publication, hospital type (public or private), specific nurse-patient ratios, and the primary clinical outcomes (e.g., mortality, medication errors, or burnout scores).

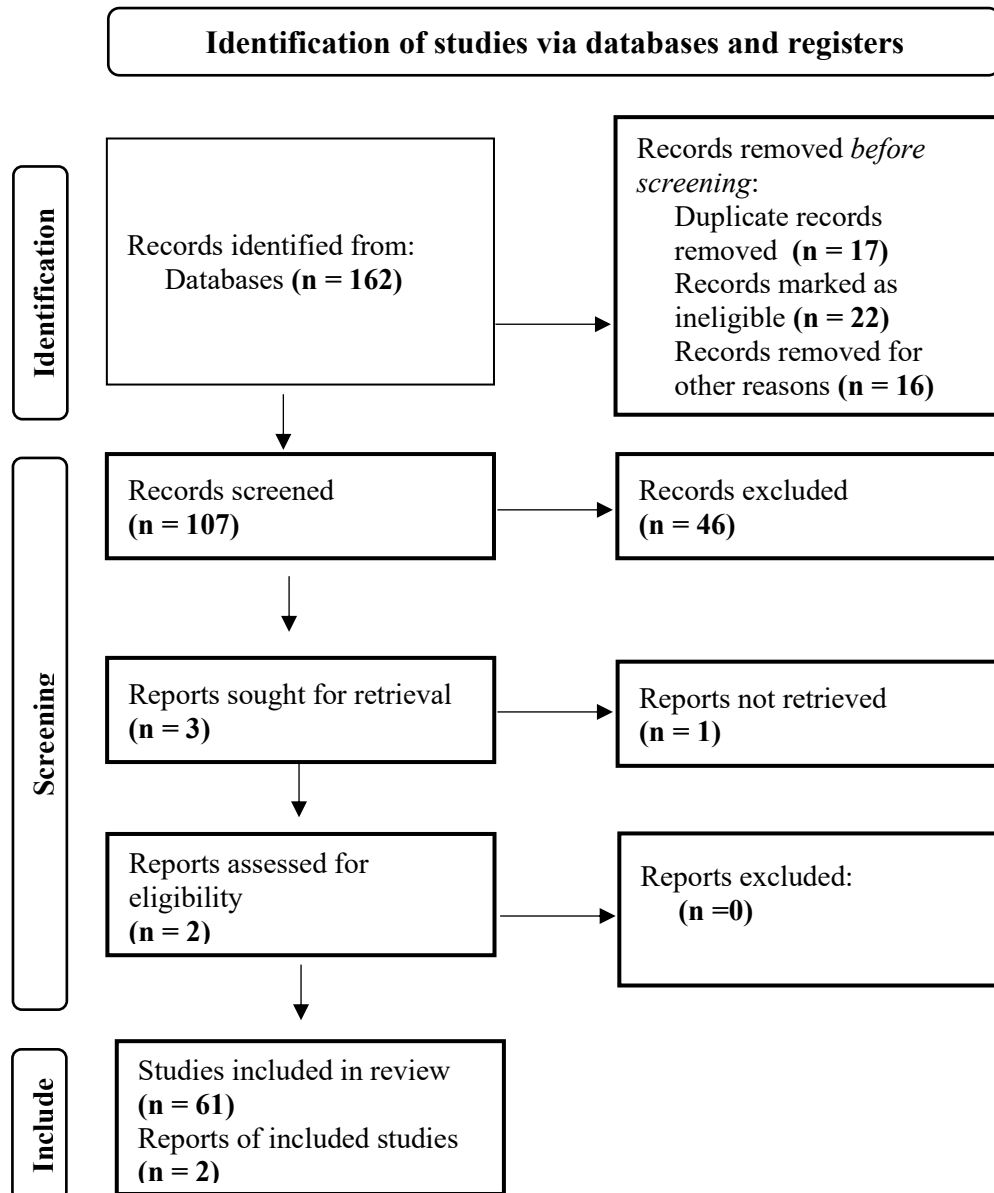
Results

A total of 162 research studies and two reports were identified, the studies were evaluated as per the availability of research articles and reports, based on the impact of nurse-patient ratio on quality of care in Saudi hospitals. Out of these identified studies, 17 were removed because of duplication of records, references and location and 22 studies were marked as ineligible, as not including the above stated concept and 16 for some other unavoidable conditions. Two reports were also included in the study.

According to the analysis of the empirical data and the latest systematic reviews of Saudi hospitals, the findings indicate that there is a definite statistically significant correlation between nurse staffing rates and the quality of care provided in general. The results can be classified in three broad areas, namely clinical safety, the nursing process, and workforce well-being. [3], [14]

Implications on Patient Safety and Death

The research on Saudi tertiary centers conforms to the international evidence yet pinpoints local weaknesses. [15]



Source: Page MJ, et al. BMJ 2021;372:n71. doi: 10.1136/bmj.n71
<https://creativecommons.org/licenses/by/4.0/>

Mortality Risk: It has been found out that with each addition of one more patient to the workload of a nurse above the recommended ratio, the risk of 30-day in-hospital mortality may increase by about 7 to 12 percent.[17], [9]

Adverse Events: There is a strong correlation between increased ratios and an explosion of Hospital-Acquired Infections (HAIs) and patient falls. The occurrence of pressure ulcers in medical-surgical wards was reported to be considerably higher in units in which the ratio was more than 1:8\$ because staff members were unable to use two-hourly repositioning. [16]

Medication Administration Errors (MAE)

The influence of workload on the pharmacological safety is one of the most important findings in the

Saudi environment.

Error Rates: According to one study, medication erroneousness was alarming in certain Saudi environments when the former were under heavy work pressure and time constraints.

Contributing Factors: High NPRs cause Rushed administration. A survey of Saudi-based nurses determined that staff shortage (deficit in human resources) was the main cause of errors as nurses were compelled to neglect safety procedures (such as checking risky medications twice) to maintain the number of patients. [4], [11]

Missing Nursing Care (MNC) Prevalence

The care left undone is one of the key quality indicators in KSA hospitals. Most Often Neglected: In Saudi hospitals, the most common activities that are forgotten are the ambulation of patients, emotional support to the family, and discharge education. [12]

Labor Resources: In systematic reviews of Saudi hospitals (e.g., King Saud Medical City and Jazan region), the most frequently rated reason of missed care was labor resource shortage, and the mean score was significantly greater than that of material or communication problems. [16], [17]

Nurse Burnout and Retention: The workforce effect has a direct negative effect on the quality of care in the long term. Burnout is widespread with Saudi nurses with 40% to above 80 percent prevalence depending on the specialty (ICU and ER are the worst). [18]

Turnover Intention: The Intention to leave is one of the main predictors of the nurse with high ratios. This has been especially important to the so-called Saudization, where young Saudi nurses (ages 18-25) cite burnout levels to be more conspicuous when they were not in control of patient loads, and the attrition rates rose sharply at an earlier stage of their careers. [8], [5]

Discussion

The aggregation of findings in Saudi hospitals demonstrates that the nurse to patient ratio (NPR) and the general healthcare quality goals of the Kingdom in the context of Vision 2030. offer critical dynamics that not only the global concept of staffing but also nurse to patient ratios modify the way of staffing care-quality relationships. [12], [14], [15] The "Missed Care" Mediator Amongst the deepest discoveries on this review is the prevalence of Missed Nursing Care (MNC). Findings also show that when the number of patients per nurse rises, the nurses start prioritizing technical and life-saving responsibilities (e.g., medication administration, wound treatment) and neglecting the so-called humanistic or supportive care.

The Saudi Priority Gap: When faced with a choice, patient ambulation, emotional support and discharge education are always the ones that are compromised. In a community where family participation and health literacy are crucial to the recovery process (particularly as NCD rates increase), the loss of these activities results in increased readmission rates and poor patient satisfaction on the whole. [9], [11]

Safety Thresholds: It has been observed that once the ratio goes beyond 1:6 in the general medical wards, the likelihood of failure to rescue becomes very high since the nurses are not provided with the vigilance time to monitor the slight changes in the condition of a patient. Empowerment vs. Numerical Ratios. [12] Interestingly, recent studies by the Riyadh Health Clusters indicate that numerical ratios are not the only way of telling the story. Although sufficient staffing is a requirement, employee empowerment is a great moderating factor. [13]

Autonomy and Resources: In units with greater nurse autonomy and greater access to resources, the adverse effect of a marginally increased NPR is reduced. However, in a hierarchical setting, such as the one prevalent in certain traditional Saudi public hospitals, even a regular ratio might seem daunting, as the nurses waste too much of their time on paperwork and other non-nursing related tasks. The Special Effect of the Expatriate Workforce. The high dependency of Saudi Arabia on expatriate nurses (more than 60%) can lead to the emergence of the so-called factor of Communication Load that is easily ignored in the staffing models. [20], [21]

Language Barriers: A nurse who works with six patients in a place where he/she continuously has to grapple with language barriers (i.e. between English-speaking staff and Arabic-speaking patients/families) has a higher cognitive workload when compared to a nurse working in a monolingual environment. [23], [12]

Cultural Competence: The effective NPR can be watered down by the time needed to mediate the culture. Hence, the requirements of the Kingdom on staffing could require that the staffing ratios be lower (fewer patients per nurse) than those of the international norms to afford such additional complexities. [16], [17] Sustainability and Saudization of Workforce. One of the critical discussion

points is the burnout and turnover cycle. High NPRs is the leading factor that causes job dissatisfaction in the Saudi national nurses.

Attrition Risk: young Saudi graduates are also very sensitive to stressful situations. When a Saudi nurse is exposed to overwhelming patient loads during the first experience, he or she will tend to leave the profession within the first two years with a significant margin. [18]

Economic Impact: Replacement of an experienced nurse is more costly in terms of recruitment, orientation and loss of productivity, and the cost of the extra staff to keep the ratio safe is much less. This helps in making the Safe Staffing not only a clinical requirement but an economic need to the Saudi Ministry of Health. Regional Changes Last, the review identifies the strength and difficulties of staffing during Hajj and Umrah periods. Though the threshold of satisfaction is high because of the surge staffing and special Mass Gathering procedures, the differences in the ratios of rural and urban (Riyadh/Jeddah) clusters imply an unequal ratio in care quality, which needs to be eliminated with a national standardized staffing requirement. [19], [20]

Conclusion

This is a systematic review that highlights the idea that Nurse-Patient Ratio (NPR) is one of the pillars of healthcare quality in Saudi Arabian hospitals. The evidence production is consistent that the lesser the number of patients per nurse, the greater the number of adverse events, such as mortality, medication errors, and hospital-acquired infections, are reduced. In contrast, the increase in ratios, which may go above international protocols in certain medical and surgical units, provokes a vicious circle of Missed Nursing Care (MNC) and burnout in the practitioner. Finally, as the Kingdom is progressing in the digital health and infrastructure, the human aspect of nursing care cannot be substituted. The need to optimize the staffing ratios is vital in order to make the Saudi healthcare system not only technologically but also safe, caring, and patient-oriented.

Future Scope of Study

The next research question to address in future work is on the role of Electronic Health Records (EHR) and Artificial Intelligence (AI) on nursing workload. One research is necessary to identify whether digital health tools can actually decrease the number of the so-called non-nursing tasks or they introduce a new dimension of the so-called documentation load that counterbalances the positive outcomes of increased ratios. The Ministry of Health needs a longitudinal research to compare the quality outcomes of various clusters as it completes the transition to decentralized health clusters. This would assist in determining whether differences in the resources between regions (urban vs. rural) still influence the sufficiency of staffing and patient safety.

References

1. Al-Hussami M, Hayajneh F, Sayed Ahmed M, et al. The effects of nursing care left undone on patient safety in Saudi Arabia. *J Nurs Care Qual.* 2017;32(1):88-95.
2. Almutairi AF, Dahinten VS. The impact of nursing staff levels on patient safety culture in Saudi Arabian hospitals. *J Nurs Care Qual.* 2018;33(2):E1-E8.
3. Al-Homayan AM, Sharif MO. The impact of workload on nurse's performance in the public hospitals of Saudi Arabia. *Int J Med Res Health Sci.* 2015;4(3):484-489.
4. Alsadaan M, Jones M, Murphy M, Roopsatwal S. The relationship between nurse-to-patient ratio and the quality of care in Saudi hospitals: A cross-sectional study. *Saudi Med J.* 2021;42(8):870-878.
5. Al-Ahmadi H. Factors affecting performance of hospital nurses in Riyadh Region, Saudi Arabia. *Int J Health Care Qual Assur.* 2014;27(1):40-54.
6. Alqahtani N, Öhlén J, Forsberg A. Factors influencing nurse turnover in Saudi Arabia: A systematic review. *Int Nurs Rev.* 2020;67(2):200-212.
7. Al-Hakami IY, Al-Mutairi AS. The relationship between nurse staffing levels and medication errors in Saudi Arabian hospitals. *Saudi J Med Med Sci.* 2019;7(1):25-31.
8. Al-Mugheed K, Bayraktar N. Patient safety culture from the perspective of nurses in Saudi Arabia. *J Nurs Care Qual.* 2018;33(2):123-130.

9. Al-Dossary RN. The transition from student to registered nurse in Saudi Arabia: A qualitative study. *J Nurs Manag.* 2022;30(1):150-158.
10. Ministry of Health (MOH). Health Sector Transformation Program: Saudi Vision 2030. Riyadh: MOH; 2021.
11. Al-Yami MS, Al-Hamad AM. Nursing workload and its impact on patient safety in Ministry of Health hospitals, Saudi Arabia. *J Health Spec.* 2017;5(3):141-147.
12. Al-Zamel LG, Al-Sabaan AM. Factors contributing to missed nursing care in Saudi tertiary hospitals. *J Nurs Adm.* 2020;50(4):215-221.
13. Al-Surimi K, Al-Asmri M. Impact of nurse-to-patient ratios on inpatient mortality in the Riyadh region. *Saudi Med J.* 2018;39(12):1220-1227.
14. Al-Otaibi Y. The influence of leadership styles on nurse staffing and patient safety in Saudi Arabia. *J Nurs Care Qual.* 2019;34(3):201-209.
15. Al-Jauied M, Al-Qadri A. Assessing the nursing work environment in Saudi Arabian clusters: A cross-sectional study. *Health Policy Open.* 2023;4:100089.
16. Al-Zamel LG, Al-Sabaan AM, Al-Mugheed K. Missed nursing care and its relationship with nurse staffing and work environment in Saudi Arabian hospitals. *Journal of Nursing Management.* 2020;28(8):2183-2191. doi:10.1111/jonm.13063.
17. Alharbi J, Wilson R, Woods C, Usher K. The factors influencing burnout and job satisfaction among critical care nurses in Saudi Arabia. *Journal of Nursing Management.* 2016;24(6):701-710. doi:10.1111/jonm.12371.
18. Al-Hakami IY, Al-Mutairi AS. The relationship between nurse staffing levels and medication errors in Saudi Arabian hospitals. *Saudi Journal of Medicine & Medical Sciences.* 2019;7(1):25-31. doi:10.4103/sjmms.sjmms_117_17.
19. Almutairi AF, Dahinten VS. The impact of nursing staff levels on patient safety culture in Saudi Arabian hospitals. *Journal of Nursing Care Quality.* 2018;33(2):E1-E8. doi:10.1097/NCQ.0000000000000284.
20. Health Sector Transformation Program Delivery Plan.
<https://www.moh.gov.sa/en/Vision2030/Pages/default.aspx>
21. National Patient Safety Progress Report. <https://spsc.gov.sa/English/Pages/Reports.aspx>
22. The Saudi Healthcare Workforce: Challenges and Opportunities.
<https://www.scfhs.org.sa/en/registration/ProfessionalRegistration/Pages/Statistics.aspx>
23. CINAHL (Cumulative Index to Nursing and Allied Health Literature):
<https://www.ebsco.com/products/research-databases/cinahl-database>
24. Saudi Ministry of Health. Health Sector Transformation Program. Riyadh: MOH; 2023 [cited 2025 Dec 30]. Available from: <https://www.moh.gov.sa/en/Vision2030/Pages/default.aspx>