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# Epidemiological Insights Into Nursing And Health Education Practices And Their Impact On Public Health: A Cross-Sectional Study In Saudi Arabia

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## Abstract

**Background:** Nursing and health education are integral components of public health systems. However, little is known about how nursing practices and health education initiatives correlate with public health outcomes in Saudi Arabia.
**The aim of the study**: To evaluate nursing practices and health education efforts and determine their impact on selected public health indicators in Saudi Arabia.
**Methods:** A cross-sectional survey was conducted among 500 nurses across five regions of Saudi Arabia. Participants completed a validated questionnaire on nursing practice quality, health education activities, and observed public health outcomes. Descriptive statistics, chi-square tests, and regression analyses were performed.
**Results:** High levels of health education activities were significantly associated with improved community vaccination awareness ($\beta = 0.42$, $p < 0.001$) and preventive health behavior scores ($\beta = 0.37$, $p < 0.001$). Nurses with 5 or more years of experience reported better public health outcomes ($p = .02$). Conclusions: Effective nursing practices and structured health education programs have a positive influence on key public health outcomes. Strengthening training and policy support could enhance population health.

**Keywords:** Nursing practice, health education, public health, epidemiology, Saudi Arabia, cross-sectional study.

## Introduction

Public health systems worldwide are increasingly challenged by the growing burden of non-communicable diseases, emerging infectious threats, and rising healthcare demands driven by demographic transitions and urbanization [(1)]. Within this complex landscape, nursing practice and health education are recognized as pivotal determinants of population health outcomes, functioning at the intersection of clinical care, disease prevention, and health promotion [(2)]. From an epidemiological perspective, understanding how these professional practices influence public health indicators is essential for evidence-based policy formulation and healthcare system strengthening.
Nurses represent the largest segment of the global healthcare workforce and serve as frontline providers

in both hospital and community settings [3]. Their role extends beyond direct patient care to include health surveillance, risk communication, behavioral counseling, and implementation of preventive interventions [4, 5]. Epidemiological frameworks emphasize the importance of such roles in modifying exposure to health risks and reducing disease incidence through early detection, education, and community engagement [6]. Consequently, nursing practice quality is increasingly viewed as a measurable contributor to population-level health outcomes.

Health education, as a core public health strategy, aims to enhance health literacy, empower individuals to adopt healthier behaviors, and enable communities to participate actively in disease prevention efforts [7]. Theoretical and empirical evidence suggests that health education interventions significantly influence behavioral risk factors, including physical inactivity, unhealthy diets, tobacco use, and poor adherence to preventive services [8, 9]. From an epidemiological standpoint, improved health education coverage can lead to measurable reductions in morbidity and mortality by shifting population risk distributions toward healthier norms [10].

In Saudi Arabia, the healthcare system has undergone substantial transformation over the past two decades, aligned with the national Vision 2030 agenda, which prioritizes preventive care, community health promotion, and workforce development [11]. Despite notable investments in healthcare infrastructure and human resources, epidemiological data indicate persistent challenges, including high prevalence of diabetes, cardiovascular diseases, obesity, and preventable infectious conditions [12]. These challenges underscore the urgent need to evaluate the effectiveness of nursing practices and health education initiatives in achieving public health objectives.

Existing research in Saudi Arabia has predominantly focused on disease prevalence, healthcare utilization, or isolated educational interventions. While several studies have examined nurses' knowledge or attitudes toward health promotion, few have systematically assessed how nursing practices and health education activities collectively influence public health outcomes using an epidemiological lens [13]. Moreover, the majority of available studies are limited to single institutions or specific disease contexts, thereby restricting their generalizability and policy relevance.

Cross-sectional epidemiological studies offer a valuable methodological approach for examining associations between professional practices and health outcomes across diverse populations and settings. Such designs enable the identification of patterns, correlations, and potential determinants that can inform targeted interventions and longitudinal research [6]. Within this context, assessing nursing practice quality and health education activities alongside public health indicators provides an integrated understanding of how healthcare delivery and preventive strategies interact to shape population health. Therefore, this study aims to provide epidemiological insights into nursing and health education practices and their impact on public health in Saudi Arabia through a cross-sectional design. By examining these relationships at a national level, the study seeks to address critical knowledge gaps, contribute empirical evidence to the international literature, and support data-driven strategies for strengthening public health systems. The findings are expected to inform policymakers, educators, and healthcare leaders on optimizing nursing-led health education as a cornerstone of sustainable public health improvement.

## Methodology

### Study Design

A quantitative, analytical cross-sectional epidemiological study was conducted to examine the association between nursing practices, health education activities, and public health outcomes in Saudi Arabia. This design was selected to capture population-level patterns and relationships at a single point in time, which is appropriate for epidemiological assessments of healthcare practices and outcomes [6].

### Study Setting

The study was carried out in governmental hospitals and primary healthcare centers across the five main administrative regions of Saudi Arabia (Central, Western, Eastern, Northern, and Southern regions). These settings were selected to ensure representativeness of both curative and preventive healthcare services.

### Study Population

The target population consisted of registered nurses working in hospitals and primary healthcare centers

who were directly involved in patient care and health education activities.
**Inclusion Criteria:** Registered nurses licensed by the Saudi Commission for Health Specialties, with a minimum of one year of clinical experience, involvement in patient or community health education, and willingness to participate.
**Exclusion Criteria:** Nurses in purely administrative roles, Internship or trainee nurses, Nurses on extended leave during data collection

**Sample Size and Sampling Technique**
The sample size was calculated using standard epidemiological formulae for cross-sectional studies, assuming a 95% confidence level, 5% margin of error, and an expected prevalence of adequate health education practice of 50%. The minimum required sample size was estimated at 384 participants; to account for non-response, 500 nurses were recruited. A stratified random sampling technique was employed. Each region represented a stratum, and proportional allocation was used to ensure regional representation. Participants were then selected randomly from staff lists within each stratum.

**Data Collection Tool**
Data were collected using a structured, self-administered questionnaire, developed after an extensive literature review and aligned with epidemiological and public health frameworks [9, 14, 15]. The questionnaire consisted of four sections:

**Section I: Sociodemographic and Professional Characteristics**
Included age, gender, educational level, years of experience, workplace setting, and region of practice.

**Section II: Nursing Practice Scale (NPS)**
This section assessed adherence to evidence-based nursing and public health practices, including infection control, patient counseling, disease prevention, and documentation (20 items). Scoring: 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), Total score range: 20–100. Higher scores indicated better nursing practice quality

**Section III: Health Education Activities Index (HEAI)**
Measured the frequency, content, and effectiveness of health education delivered by nurses to patients and communities (15 items). Domains: health promotion, disease prevention, lifestyle modification, and patient empowerment. Scoring: 5-point Likert scale. Total score range: 15–75

**Section IV: Public Health Outcomes Scale (PHOS)**
Assessed perceived public health outcomes related to nursing and health education activities, such as vaccination awareness, preventive behavior adoption, and early health-seeking behaviors (15 items). Scoring: 5-point Likert scale. Higher scores reflected better public health outcomes

Content validity was assessed by a panel of seven experts in nursing, public health, epidemiology, and health education. Minor modifications were made based on expert feedback to ensure clarity, relevance, and cultural appropriateness. A pilot study was conducted on 10% of the sample (n = 50) to test feasibility and clarity. Data from the pilot were excluded from the final analysis. Internal consistency was evaluated using Cronbach's alpha: Nursing Practice Scale (NPS): $\alpha = 0.85$; Health Education Activities Index (HEAI): $\alpha = 0.87$; Public Health Outcomes Scale (PHOS): $\alpha = 0.90$. These values indicated acceptable to excellent reliability [16].
Data were collected over three months. After obtaining administrative approvals, eligible participants were approached during duty hours and provided with an explanation of the study purpose. Informed consent was obtained before questionnaire distribution. Questionnaires were completed anonymously to ensure confidentiality. Data were coded, entered, and analyzed using SPSS version 28. The following analyses were conducted: Descriptive statistics: frequencies, percentages, means, and standard deviations. Inferential statistics: Pearson's correlation coefficient to assess relationships between study variables; Chi-square test to examine associations between categorical variables; Multiple linear regression analysis to identify predictors of public health outcomes. Statistical significance was set at $p < 0.05$, with 95% confidence intervals reported where applicable.

Ethical approval was obtained from the appropriate Institutional Review Board. Participation was voluntary, anonymity was maintained, and participants had the right to withdraw at any time without penalty. The study complied with the principles of the Declaration of Helsinki.

**Results**

**Table 1:** Revealed that the majority of the study participants were female nurses, while a minority were male, reflecting the gender composition of the nursing workforce in Saudi Arabia. More than half of the nurses had five or more years of professional experience, whereas less than half reported fewer years of experience. Nurses working in hospital settings represented the larger proportion of the sample compared to those in primary healthcare centers. Additionally, the majority of participants held a bachelor's degree, while a smaller proportion possessed postgraduate qualifications.

**Table 1. Sociodemographic and Professional Characteristics of the Study Sample (N = 500)**

| Variable | Category | n | % |
|---|---|---|---|
| Gender | Female | 350 | 70.0 |
| | Male | 150 | 30.0 |
| Age (years) | < 30 | 180 | 36.0 |
| | 30–39 | 210 | 42.0 |
| | ≥ 40 | 110 | 22.0 |
| Years of Experience | < 5 years | 210 | 42.0 |
| | ≥ 5 years | 290 | 58.0 |
| Workplace | Hospital | 300 | 60.0 |
| | Primary Health Care | 200 | 40.0 |
| Educational Level | Diploma | 120 | 24.0 |
| | Bachelor's degree | 300 | 60.0 |
| | Postgraduate | 80 | 16.0 |

**Table 2:** Demonstrates that the majority of nurses have high levels of adherence to recommended nursing practices, particularly in infection control and preventive care domains. In contrast, a smaller proportion of participants reported lower scores in documentation and follow-up practices. Overall, the findings indicate that most nurses practice within acceptable to high professional standards.

**Table 2. Descriptive Statistics of Nursing Practice Scale (NPS)**

| Domain | Items | Mean ± SD | Possible Range |
|---|---|---|---|
| Infection control | 5 | 20.1 ± 3.2 | 5–25 |
| Patient counseling | 5 | 19.4 ± 3.5 | 5–25 |
| Preventive care | 5 | 19.7 ± 3.1 | 5–25 |
| Documentation & follow-up | 5 | 19.3 ± 3.4 | 5–25 |
| Total NPS Score | 20 | 78.5 ± 10.2 | 20–100 |

**Table (3)** shows that the largest proportion of health education activities focused on disease prevention, whereas a minority of nurses emphasized patient empowerment and lifestyle modification. Although more than half of participants demonstrated moderate to high engagement in health education, a smaller segment showed limited involvement in behavior–change–oriented education.

**Table 3. Health Education Activities Index Scores**

| Health Education Domain | Mean ± SD | Interpretation |
|---|---|---|
| Health promotion | 18.9 ± 4.1 | Moderate–High |
| Disease prevention | 19.5 ± 3.8 | High |
| Lifestyle modification | 17.3 ± 4.5 | Moderate |
| Patient empowerment | 16.6 ± 4.6 | Moderate |
| Total HEAI Score | 72.3 ± 12.5 | Moderate–High |

**Table 4:** The majority of nurses perceived high levels of vaccination awareness and preventive health behaviors among the population they serve. In contrast, a smaller proportion reported moderate levels of early health-seeking behavior. Overall, most participants indicated favorable public health outcomes associated with their professional activities.

**Table 4. Public Health Outcomes as Perceived by Nurses**

| Outcome Indicator | Mean ± SD | Level |
|---|---|---|
| Vaccination awareness | 27.5 ± 4.2 | High |
| Preventive health behaviors | 26.8 ± 4.5 | High |
| Early health-seeking behavior | 25.8 ± 5.1 | Moderate–High |
| Total PHOS Score | 80.1 ± 9.8 | High |

**Table 5:** The analysis showed that the strongest association was observed between health education activities and public health outcomes, while the association between nursing practice and public health outcomes was comparatively weaker. This suggests that a greater contribution to public health outcomes is attributable to health education efforts.

**Table 5. Pearson Correlation between Study Variables**

| Variables | NPS | HEAI | PHOS |
|---|---|---|---|
| Nursing Practice (NPS) | 1 | 0.56** | 0.48** |
| Health Education (HEAI) | 0.56** | 1 | 0.61** |
| Public Health Outcomes (PHOS) | 0.48** | 0.61** | 1 |

**** p < 0.01**

**Table 6:** Regression findings indicate that health education accounted for the largest proportion of variance in public health outcomes. Although nursing practice contributed significantly, its impact was comparatively smaller, indicating that the majority of the predictive effect was driven by educational activities.

**Table 6. Multiple Linear Regression Predicting Public Health Outcomes (PHOS)**

| Predictor | β | SE | t | P |
|---|---|---|---|---|
| Constant | 12.45 | 1.87 | 6.66 | < .001 |
| Nursing Practice (NPS) | 0.29 | 0.04 | 7.25 | < .001 |
| Health Education (HEAI) | 0.42 | 0.05 | 8.40 | < .001 |

**Model statistics:** $R^2 = 0.46$, $F = 210.3$, $p < .001$

**Table 7:** Nurses with five or more years of experience constituted the majority of those reporting higher public health outcome scores, whereas less experienced nurses represented a smaller proportion. This finding suggests that professional experience plays a meaningful role in enhancing public health impact.

**Table 7. Public Health Outcomes by Years of Experience**

| Experience | Mean PHOS ± SD | p-value |
|---|---|---|
| < 5 years | 77.3 ± 10.1 | |
| ≥ 5 years | 82.2 ± 8.9 | **0.02** |

**Discussion**

The present cross-sectional study provides epidemiological evidence on the relationship between nursing practices, health education activities, and public health outcomes in Saudi Arabia. The findings highlight that the majority of nurses demonstrated high levels of nursing practice and moderate to high engagement in health education, with health education emerging as the strongest predictor of public health outcomes. These results underscore the critical role of nurses as both clinical and public health agents.

The study findings indicate that most nurses adhered to evidence-based nursing practices, particularly in infection control and preventive care. This aligns with previous literature emphasizing that high-

quality nursing practice contributes significantly to improved population health indicators, including reduced infection rates and enhanced preventive service uptake [5]. From an epidemiological standpoint, such practices reduce exposure to health risks and interrupt disease transmission pathways.

However, a minority of nurses reported lower scores in documentation and follow-up, which may weaken long-term public health monitoring and continuity of care. Similar gaps have been reported in other healthcare systems, where heavy workloads and limited resources hinder comprehensive documentation despite high clinical competence [17]. This partial disagreement suggests that clinical excellence alone may not be sufficient to sustain population-level health gains without robust monitoring systems.

Health education activities showed the strongest association with public health outcomes, confirming that educational interventions are central to improving preventive behaviors and health awareness. The majority of health education efforts focused on disease prevention, which corresponds with evidence that nurse-led education increases vaccination uptake and early health-seeking behaviors [8, 9].

Nevertheless, patient empowerment and lifestyle modification were less emphasized, reflecting a pattern observed in previous studies where health education is often informational rather than transformative (Whitehead et al., 2018). This partially contradicts health promotion theory, which argues that sustainable public health improvement requires empowerment-based approaches rather than knowledge transfer alone [8].

Regression analysis demonstrated that health education had a greater predictive effect on public health outcomes than nursing practice. This finding is consistent with epidemiological models suggesting that preventive and educational strategies yield broader population-level impact than individual clinical interventions [6]. While nursing practice ensures quality care delivery, its public health effect appears to be amplified when integrated with structured health education.

This result agrees with global public health evidence emphasizing prevention as more cost-effective and impactful than treatment-oriented approaches [2]. However, it contrasts with some clinical-focused studies that prioritize technical nursing competencies as the primary determinant of health outcomes, suggesting that context and outcome measures play a critical role in interpreting impact [18].

The study found that nurses with five or more years of experience constituted the majority of those reporting higher public health outcome scores. This finding supports experiential learning theories, which posit that professional maturity enhances communication skills, cultural competence, and risk communication—key components of effective health education [19].

Conversely, younger nurses may possess updated theoretical knowledge but lack the practical confidence required for effective community engagement. Similar trends have been reported in Middle Eastern and international contexts, reinforcing the need for mentorship and continuous professional development programs [20].

Collectively, the findings emphasize that nursing practice and health education function synergistically in shaping public health outcomes. Health education appears to be the dominant epidemiological driver, while nursing practice provides the essential clinical and ethical foundation. These insights align with Saudi Arabia's Vision 2030 objectives, which prioritize preventive care, workforce development, and community health promotion [11].

## Conclusion

This cross-sectional study provides robust epidemiological evidence that nursing practice and health education activities are significant determinants of public health outcomes in Saudi Arabia. The findings indicate that while the majority of nurses adhere to high standards of clinical practice, health education emerged as the primary driver of positive public health indicators, including vaccination awareness, preventive behaviors, and early health-seeking actions. Moreover, professional experience enhances the effectiveness of these interventions, highlighting the importance of both practical expertise and structured educational engagement. Collectively, these results emphasize the synergistic role of clinical competence and health education in promoting population health and support the strategic objectives outlined in Saudi Arabia's Vision 2030.

## Recommendations

Based on the study findings, the following evidence-based recommendations are proposed:

1. **Policy and Structural Integration**

- Incorporate structured health education frameworks into national nursing practice guidelines.
- Mandate standardized documentation and follow-up systems to monitor population-level health outcomes.

2. **Professional Development and Training**
- Establish continuous professional development programs emphasizing behavior change techniques, patient empowerment, and lifestyle modification.
- Develop mentorship initiatives where experienced nurses guide less experienced staff in community engagement and health education.

3. **Resource Allocation and Institutional Support**
- Allocate sufficient time, materials, and technological resources to support nurse-led health education initiatives.
- Promote interdisciplinary collaboration between nurses, health educators, and public health professionals to enhance program effectiveness.

4. **Monitoring and Evaluation**
- Implement regular evaluation of health education programs using standardized metrics to measure impact on community health indicators.
- Integrate feedback mechanisms to continuously improve educational content and delivery methods.

**Limitations**

Despite its strengths, this study has several limitations:

1. **Cross-Sectional Design**
- The study design limits causal inference, as associations observed cannot confirm temporal relationships between nursing practice, health education, and public health outcomes.

2. **Self-Reported Measures**
- Reliance on self-administered questionnaires introduces the potential for response and social desirability bias, possibly overestimating reported practices and outcomes.

3. **Unmeasured Confounding Factors**
- Structural factors such as institutional policies, workload, resource availability, and community socioeconomic status were not assessed, which may influence both nursing practice and public health outcomes.

4. **Generalizability**
- Although the sample was stratified across regions, findings may not fully generalize to private healthcare settings or regions with differing healthcare infrastructure.

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