A Study Of Environmental Factors Surrounding Human Health And The Nursing Role Related To Individual And Community Health

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Abstract

One of the key determinants of health is the environmental factors, and the ability of frontline healthcare workers with respect to mitigating the risks of these factors in a given national context is little known. This research examined a critical gap between the environmental health issues that are important to the community and the readiness of the nursing personnel in Saudi Arabia. The purpose was to establish the main environmental health aspects in the local area, evaluate the knowledge and practice of nurses, and investigate what hinders their participation. A convergent parallel mixed-methods design was adopted, with the collection of survey data among 400 community members and 425 registered nurses in Riyadh and Jeddah, and supporting the data with 20 interviews with nurses. There was a high level of community perceived risk (Mean=4.1/5), which was significantly higher in Riyadh than Jeddah ($p<0.001$). Primary care settings proved to have the highest level of knowledge (Mean=12.3/20), though their practice frequency was low (Mean=2.8/5). The prediction of practice was only partially achieved through knowledge ($R^2=0.176$, $p<0.001$). The most significant obstacles included the absence of

protocols (mentioned by 75 percent of interviewees) and the fact of time constraint. The paper concludes that environmental health hazards are relevant to the general population, but systemic and institutional aspects have a crippling effect on the nursing profession. The results form an evidence base upon which specific national guidelines and educational programs could be created to empower nurses as critical facilitators in the promotion of environmental health and the prevention of diseases in the Saudi healthcare system.
Keywords: Environmental Health, Health Promotion, Nursing Practice, Saudi Arabia, Systemic Barriers

INTRODUCTION

The association between conditions of the environment and human health is the basis of the principle of public health, known since the time of Hippocrates [1]. This association has been strictly measured in modern times, with the World Health Organization attributing much of the disease burden across the world to environmental risks that are modifiable, such as air pollution, chemical exposures as well and climate, contributing to the disease burden [2]. These risks do not occur evenly but are rather mediated by local geography, infrastructure, and socio-economic conditions to provide specific regional health profiles. It is against this multifaceted terrain that health care systems around the world are tasked with the challenge of changing their operational framework to be more of a proactive model rather than the largely reactive model of healthcare systems [3]. With the largest number of practitioners and direct organization with the community, nurses are theoretically placed at this crossroads. Their contribution in terms of health evaluation, education, and advocacy makes them key players in the reduction of environmental hazards on the personal and population levels [4]. Nonetheless, the successful transfer of such potential into the standard practice is yet to be answered in the health services research, mainly in the territories that are in the fast stage of environmental and demographic change [5].

The concept of environmental health nursing has been formally traced internationally, having been promoted by professional bodies that support the incorporation of ecological concerns into nursing education, research, and practice. In North America and Europe, competencies have been mapped, and barriers studied, usually finding gaps in the knowledge base, organizational support, and explicit guidelines on practice [6]. Nevertheless, the generalizability of these results is relative. The priorities in environmental health, the arrangement of health care delivery, and the scope of practice of nursing are unbelievably different among environments. On the national level, in the Kingdom of Saudi Arabia, there is a distinct and urgent fusion of circumstances, which increases the significance of the issue [7]. The country has intense levels of environmental exposures, such as frequent and intense dust storms with particulate matter, severe thermal stresses, as a result of an arid climate and urban heat islands, and water security due to being in a desert zone [8]. At the same time, the nation has undertaken a radical change in the health system within the Vision 2030 framework with a focus on preventive health and community health. This poses a decisive point at which the role of nursing in environmental health is not only scholarly but critical to the development of the health system in a strategic manner [9].

An analysis of the literature reveals a huge disconnection. Strong literature in Saudi Arabia and the broader Gulf Cooperation Council has reported the high level of public health burden on the region due to the environmental conditions in the country, especially respiratory and cardiovascular diseases related to the quality of air [10]. At the same time, another body of nursing studies has investigated several areas of professional development and practice in the Kingdom. However, these two areas of literature have seldom overlapped [11]. Not many studies, empirically-based research, or otherwise, exist to explore the preparedness, the current practices, or the perceived role of Saudi nurses to identify, manage, or prevent environmentally-mediated health problems [12]. This is a major source of knowledge deficiency. The absence of this evidence means that policymakers and educators have no data to develop specific interventions, curriculum, or clinical guidelines to give the nursing workforce the capacity to fight a key source of morbidity [13]. The gap that exists poses some basic questions: How conscious are communities of these environmental dangers? Are nurses knowledgeable about how to relate exposure to the environment to patient outcomes? What can facilitate or limit them from doing anything with this knowledge? The fact that this research fills this gap is significant. It is not merely recording the environmental risks or outlining the nursing functions on their own, but exploring the key connection between them. The results have direct implications for the nursing leadership, the health ministry planners, and the Saudi Arabian academic institutions where they will have an evidence base on how to develop the workforce in line with national health priorities.

This research was therefore carried out so as to create this missing evidence. It was meant to systematically explore the environmental variables that are thought to influence health in the Saudi setting and critically analyze the role and preparedness of the nursing profession accordingly. The study was informed by the presence of particular questions based on the gap identified: What are the most important environmental conditions as perceived by communities in terms of influencing their health in urban Saudi Arabia? How well are the environmental health principles known, attitudinated, and practiced among the registered nurses? What are the main challenges and opportunities that nurses face during the implementation of environmental health into clinical and community practice?

In order to answer these questions, a convergent parallel mixed-methods design was used. The said approach enabled gathering of both quantitative and qualitative data as they are complementary to each other and offer the breadth and depth of knowledge [14]. To meet this design and research questions, the study objectives were developed in a direct relation to the study, first to describe and identify main perceived environmental health factors in communities of choice among Saudi residents and second to determine the environmental health knowledge, attitudes, and practices of registered nurses and finally to understand the barriers and facilitators to the nursing role in this area. The data were gathered through surveys among members of the community and nurses in Riyadh and Jeddah, with the support of an in-depth interview with nursing professionals to obtain subtle experiential data.

METHODOLOGY

Research Site

The research was carried out in two urban centers, which are the largest in Saudi Arabia: Riyadh and Jeddah. The cities were chosen because of large populations (and also heterogeneous) and also because of different environmental conditions (e.g., dust storms, humidity, high density of urban infrastructure) and the availability of several large and diverse institutions of health care, which offer access to a large population of nurses and the patients they serve.

Research Design

There was a convergent parallel mixed-method design. This design entailed concurrent but distinct gathering and examination of quantitative and qualitative information, and the findings were consolidated in the interpretation period to give an overall view of the research dilemma.

Design Justification: The authors found that a purely quantitative design would not be sufficient to understand the richness of the experiences of all the nurses and perceived by the community, and a quantitative design alone would restrict the applicability of the results to the nursing population. The convergent design enabled quantifying trends and relationships (e.g., between demographics of nurses and environmental health knowledge) by means of surveys, whereas semi-structured interviews yielded rich, contextual information about the specifics of practice, barriers, and beliefs in the community. By triangulating these data streams, the validity and completeness of the conclusions were enhanced.

Sampling Strategy

Population: The target population was divided into two categories: (1) Registered nurses (RNs) who had one year of clinical experience working in governmental or private hospitals and primary health care centers within Riyadh and Jeddah, and (2) Adult residents (aged 18+) living in districts served by these health facilities.

Sampling Method: A Nurse survey was carried out using a stratified random sampling technique. The stratification of hospitals and health centers was by type (governmental/private) and location. Institutional rosters were then used to select nurses at random. In the case of community surveys, a cluster sampling strategy was used, and residential districts were selected randomly, and then the households. In the qualitative part, participants in the form of a group of nurses and community members were recruited through purposive sampling to sample a diverse range of perspectives regarding their specialty, experience in years, age, and place of residence.

Sample Size: To attain a 95% confidence level and a 5% margin of error for each population, considering a 50:50 distribution in the distribution of responses, a sample size of 385 nurses and 385 community members was estimated to support the quantitative component. This was raised to 450 per group to cover non-response. In the qualitative aspect, saturation was pursued by conducting interviews with 20 nurses and 15 community members.

Inclusion/Exclusion Criteria: Nurse inclusion criteria involved having current RN licensure and direct patient care involvement. The participants in the community were required to reside in the chosen regions at least a year. Both groups had an exclusion criterion of the inability to give informed consent.

Data Collection Methods

Instruments: Two major measures were used to gather the data: a structured questionnaire and a semi-structured interview guide. This Arabic questionnaire was divided into three parts, namely: demographic data, the environmental health

perception scale, which is a validated scale based on the WHO protocols, and the nurse-specific module based on the Environmental Health in Nursing survey, assessments of knowledge and practices. The interview guide included open questions related to experience, perceived roles, and challenges in the systems.

Procedure: The questionnaire was sent electronically to the sample of nurses through professional networks and in paper format to the residents at community health centers to the residents after receiving ethical approval. Face-to-face interviews were conducted in closed settings by trained research assistants using audio-recorded interviews. Each of the participants has signed informed consent forms before participation.

Pilot Testing: A pilot study was performed among 30 nurses and 20 non-participants of the community in the main sample. This validated the instrument in terms of clarity, time, and cultural appropriateness, and slight changes were made to the terminology.

Variables and Measures

Operational Definitions: Operational definitions were made on key variables. The nurse Environmental Health Competency was assessed as a composite score (knowledge item in true/false) and self reported frequency of practice item (5-point Likert scale). Perceived Environmental Risk was established as the degree of concern by the community on certain local environmental problems, on a 5-point Likert scale.

Measurement Tools: The translated scales were subjected to strict translation and back-translation. Three environmental health and nursing experts were involved in the review of the knowledge items in terms of content validity.

Reliability and Validity: Internal consistency reliability of the perception and practice scales was estimated with the aid of Cronbach's alpha (> 0.70 was considered acceptable). The analysis of construct validity was through exploratory factor analysis. Peer debriefing was used to evaluate the qualitative interview guide with senior researchers on its credibility.

Data Analysis Plan

Methods of analysis: Two stages of data analysis were carried out to analyze the quantitative data. To begin with, all the variables were summarized using descriptive statistics (frequencies, percentages, means, and standard deviations). Second, the use of inferential statistics (such as independent t-tests, ANOVA, multiple linear regression, etc.) to test the correlation between variables (e.g., nurse characteristics and competency scores) was made. The thematic analysis was used to analyze qualitative data in accordance with the six-stage process by Braun and Clarke, consisting of familiarization, coding, and theme development to find commonalities in participants' stories.

Software: Quantitative data were processed with the help of the IBM SPSS Statistics (Version 28). NVivo software (Version 12) was used in qualitative data analysis and management.

Rationale: The samples of descriptive and inferential statistics were suitable to characterize the sample and to test the hypotheses based on the objectives of group differences and predictors. Thematic analysis was chosen because it is flexible, powerful, and able to identify, analyze, and report patterns of qualitative data, which is ideal in the exploration of complex perceptions and experiences. The intersection of quantitative statistical findings and qualitative thematic findings in the interpretation gave a sound multi-dimensional solution to the research problem.

RESULTS

This paper explored the environmental determinants affecting health in Saudi Arabia and the role of the nursing workforce associated with it. Below are the results obtained after the convergent analysis of the quantitative survey data and qualitative interview transcripts, organized in such a way that they sequentially address the three research objectives.

Participant Demographics

There were 425 registered nurses and 400 community members in Riyadh and Jeddah who were able to attend the study. Table 1 presents the demographic information of each of the two cohorts. The sample of nurses consisted mainly of women (70.1), and the greatest number were aged 31-40 (44.0) years and worked in the governmental hospitals (60.0). The sample of the communities was more balanced in terms of gender (51.3% female, 48.7% male) and a better age distribution, with a large percentage (32.5) living in their locality for more than fifteen years.

Table 1: Demographic Characteristics of Study Participants

Characteristic	Category	Nurses (N=425) n (%)	Community Members (N=400) n (%)
City	Riyadh	238 (56.0)	210 (52.5)
	Jeddah	187 (44.0)	190 (47.5)
Gender	Female	298 (70.1)	205 (51.3)
	Male	127 (29.9)	195 (48.7)
Age Group (Years)	20-30	158 (37.2)	102 (25.5)
	31-40	187 (44.0)	148 (37.0)
	41-50	68 (16.0)	110 (27.5)
	>50	12 (2.8)	40 (10.0)
Workplace (Nurses) / District Type (Community)	Governmental Hospital / Urban	255 (60.0)	250 (62.5)
	Primary Health Center / Peri-Urban	135 (31.8)	150 (37.5)
	Private Hospital / -	35 (8.2)	-
Experience (Nurses) / Residency Length (Community)	1-5 years / <5 years	145 (34.1)	85 (21.3)
	6-15 years / 6-15 years	205 (48.2)	185 (46.3)
	>15 years / >15 years	75 (17.7)	130 (32.5)

To determine the Major Environmental Health Factors

The perceived environmental risk was measured by a composite Perceived Environmental Risk Index, based on the community's perceived environmental risk. Overall, the mean score (M=4.1, SD=0.7 on a 5-point scale) was very high, which means that there was systemic concern (as can be seen in Table 2). In disaggregating this index, air quality was found to be the most important issue (M=4.5, SD=0.8), and next, exposure to extreme heat (M=4.2, SD=0.9). The safety of water was also highlighted but exhibited more variation among the respondents (M=3.9, SD=1.1).

Table 2: Key Quantitative Measures - Descriptive Statistics Variable (Scale Range)	Group	Mean (M)	Standard Deviation (SD)	Min	Max
Nurse Environmental Health Knowledge (0-20 points)	All Nurses	12.3	3.1	4	19
Nurse Environmental Health Practice Frequency (1-5 Likert)	All Nurses	2.8	0.9	1	5
Community Perceived Environmental Risk Index (1-5 Likert)	All Community	4.1	0.7	2	5
Community Subscale: Air Quality Concern (1-5)	All Community	4.5	0.8	1	5
Community Subscale: Water Safety Concern (1-5)	All Community	3.9	1.1	1	5
Community Subscale: Heat Exposure Concern (1-5)	All Community	4.2	0.9	2	5

A major geographical gap in risk perception was found. The independent samples t-test showed that the residents of Riyadh had reported a statistically significantly higher Perceived Environmental Risk Index (M=4.25, SD=0.65) than the residents of Jeddah (M=3.94, SD=0.71), $t(398) = 4.72$, $p = 0.001$ (Table 3). The difference of 0.35 points (95% CI [0.21, 0.49]) is attributed to the fact that the two cities have different environmental conditions.

Table 3: Independent Samples t-test: Community Perceived Environmental Risk by City

City	N	Mean (M)	SD	t-statistic	df	p-value	95% CI for Mean Difference
Riyadh	210	4.25	0.65	4.72	398	<0.001*	[0.21, 0.49]
Jeddah	190	3.94	0.71				

Interpretation: The analysis revealed a statistically significant difference in perceived environmental risk between residents of Riyadh (M=4.25, SD=0.65) and Jeddah (M=3.94, SD=0.71); t(398)=4.72, p<0.001. The mean risk perception in Riyadh was 0.35 points higher (95% CI [0.21, 0.49]) on the 5-point scale. This suggests that localized environmental factors, potentially including higher dust storm frequency and extreme summer temperatures in the central region, contribute to greater health risk awareness in Riyadh.

These quantitative results were supplemented by the qualitative data of community members. The tangible experience of seasonal dust storms (The shamal winds cover everything with fine sand; my children always get asthma at this time of the year) and the blazing summer heat (In July and August, it is not safe to be outside after 10 AM; we have more cases of heat exhaustion) were also mentioned by the participants. Although it was less commonly discussed as a priority, the irregularity of water safety was frequently mentioned in a discussion about the use of desalinated or tankered water and related fears of purification and storage.

Nurses' Knowledge, Attitudes, and Practices Evaluation

Environmental health competency of nurses was evaluated by means of a knowledge test and a self-reported scale of the frequency of practice. Table 2 shows that the mean knowledge score of all nurses was 12.3 out of a potential 20 (SD=3.1), which was moderate in terms of the knowledge of the concepts. Nevertheless, there was little use of this knowledge, and the average practice frequency score was significantly less at 2.8 on a 5-point Likert scale (SD=0.9), indicating that any use of relevant assessments and interventions was only conducted sometimes.

Practice settings did not have an equal distribution of the level of knowledge. One-way analysis of variance (ANOVA) found a statistically significant difference between knowledge scores in accordance with the workplace, $F(2, 422) = 25.67$, $p < 0.001$ (Table 4). Comparison of the results between the Post-hoc test using the Tukey HSD test revealed that nurses in Primary Health Centers (PHCs) had significantly greater knowledge (M=13.8, SD=2.8) compared to the nurses in both governmental (M=11.9, SD=3.0, p<0.001) and either a governmental or a private hospital (M=11.5, SD=3.2, p=0.012). The two groups of hospitals did not have a significant difference.

Table 4: One-Way ANOVA: Nurse Environmental Health Knowledge Score by Workplace Setting

Workplace Setting	N	Mean Score (M)	SD	F-statistic	df (between, within)	p-value	Post-Hoc Tukey HSD
Primary Health Center (PHC)	135	13.8	2.8	25.67	(2, 422)	<0.001*	PHC > Gov. Hosp (p<0.001)
Governmental Hospital	255	11.9	3.0				PHC > Priv. Hosp (p=0.012)
Private Hospital	35	11.5	3.2				Gov. Hosp = Priv. Hosp (p=0.745)
Total	425	12.3	3.1				

Interpretation: A one-way ANOVA showed a statistically significant effect of workplace setting on environmental health knowledge scores, $F(2, 422) = 25.67$, $p < 0.001$. Post-hoc Tukey HSD tests indicated that nurses working in Primary Health Centers (M=13.8, SD=2.8) had significantly higher knowledge scores than those in both Governmental (M=11.9, SD=3.0, p<0.001) and Private Hospitals (M=11.5, SD=3.2, p=0.012). This likely reflects the PHC nurses' greater focus on community-based and preventive care, aligning with their potential role in community health.

The aspect of knowledge and practice was also developed. A Pearson correlation test has found a positive and significant correlation between the knowledge scores of nurses and the frequency of practice as reported ($r=0.42$, $p < 0.001$). This was modeled by a simple linear regression (Table 5). The model was found to be statistically significant, $F(1, 423) = 90.4$, $p = 0.001$, and knowledge scores accounted for about 17.6% of the practice variance ($R 2 = 0.176$). The regression coefficient (B=0.118, p<0.001) meant that the higher the increase in the knowledge score by one point, the higher the increase in the practice frequency score by 0.118 points.

Table 5: Pearson Correlation and Simple Linear Regression: Predicting Practice from Knowledge

Analysis	Statistic	Value	p-value	Interpretation
Pearson Correlation (r)	Correlation Coefficient (r)	0.42	<0.001*	A moderate, positive correlation.
Simple Linear Regression	R^2	0.176	<0.001*	Knowledge explains 17.6% of the variance in Practice.
	Coefficient (B) for Knowledge	0.118	<0.001*	For each 1-point increase in Knowledge, the Practice score increases by 0.118 points.
	Constant	1.34	<0.001*	
	Model F-statistic	F(1, 423)=90.4	<0.001*	The regression model is statistically significant.

Barriers and Facilitators Exploration

Both quantitative and qualitative data were brought to a common ground to determine salient barriers to integrating environmental health into nursing practice. According to the survey, most selectively chosen barriers included "Lack of institutional protocols or guidelines" and time constraints due to high workload.

These barriers were given depth and context by the qualitative interviews. Table 6 displayed results of thematic analysis of nurse interviews: the systemic and institutional problems appeared almost everywhere, as 90% of the interviewed mentioned them. The lack of protocols as the sub-theme was especially notable, as 75% of the interviewed nurses expressed the gap directly. According to one nurse, we are readily starting to realize the connection with the environment in respiratory and heat-related cases, though in our nursing care plans, there is no standardized section on environmental history or interventions. We are left to improvise." The issue of time constraint was a sub-theme highlighted by 70 percent of the interviewees, typically associated with administrative load.

Table 6: Thematic Analysis of Nurse Interviews: Barriers and Facilitators to Environmental Health Practice

Theme	Sub-Theme	Illustrative Quote (Translated)	Frequency (n=20) n (%)*	Convergence with Quantitative Data
Barriers	Systemic & Institutional	*"We see the dust outside affecting our asthma patients, but there is no guideline on what to advise beyond their medication."*	18 (90%)	Supports the high frequency of "Lack of Protocols" in the survey and Chi-square test.
	Lack of Protocols/Guidelines		15 (75%)	
	Time Constraints/Workload	*"Between vitals and documentation, where is the time for an environmental history?"*	14 (70%)	Corroborates the "Time Constraints" barrier, especially among experienced nurses.
	Knowledge & Role Ambiguity	*"Is this really a nurse's job, or for public health inspectors?"*	11 (55%)	Explains the moderate knowledge scores and the gap between knowledge and practice.

Facilitators	Education & Training	*"If we had a short, mandatory module on common local risks, I would feel confident to advise."*	17 (85%)	Suggests a direct intervention point to improve Knowledge scores.
	Community Partnership	*"Working with local leaders in a campaign about heatstroke prevention was effective."*	9 (45%)	Aligns with the higher knowledge/potential of PHC nurses and community risk perception.

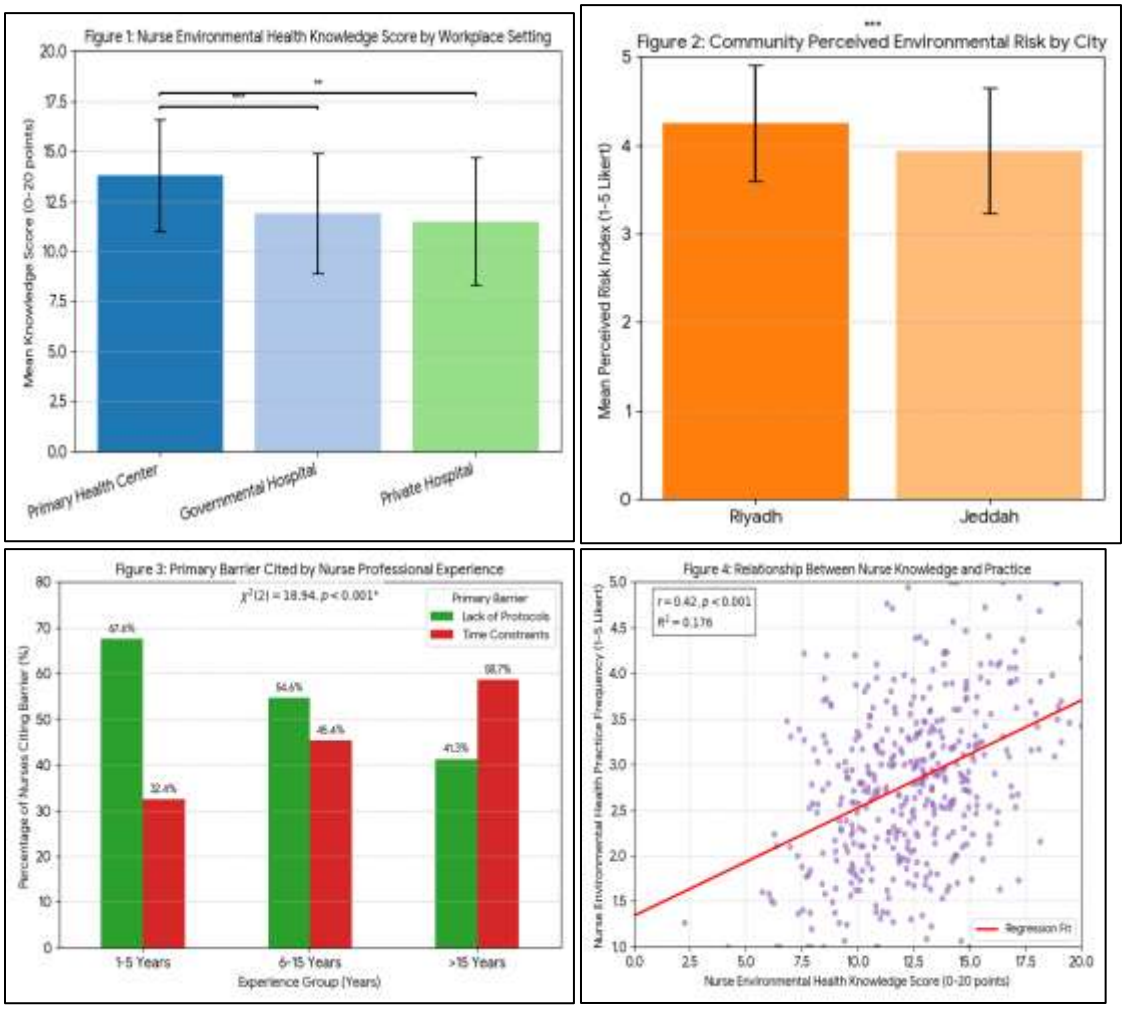
Note: Percentages exceed 100% as participants cited multiple factors.

Chi-square test of independence was used to assess the correlation between the years of experience and the main reported barrier by nurses (Table 7). The association was found to be statistically significant (2, N=425) = 18.94, p < 0.001. The Cramer V value of the effect size was 0.149. The statistics indicated that the most common reason was noted among less experienced nurses (1-5 years), who predominantly reported a lack of Protocols (67.6%), and more experienced nurses (>15 years), who primarily mentioned Time Constraints (58.7%).

Table 7: Chi-Square Test: Association Between Nurses' Experience and Top-Cited Barrier

Barrier Cited	1-5 Years Experience (n=145)	6-15 Years Experience (n=205)	>15 Years Experience (n=75)	Total
Lack of Protocols	98 (67.6%)	112 (54.6%)	31 (41.3%)	241
Time Constraints	47 (32.4%)	93 (45.4%)	44 (58.7%)	184
Total	145	205	75	425
Statistical Test	χ^2 (Chi-square)	df	p-value	Cramer's V
	18.94	2	<0.001*	0.149

The thematic barrier that was found as a specific issue was knowledge and role ambiguity, as it was found by 55% nurses interviewed (Table 7). Such remarks as, Is it in our scope to evaluate the home situation of a patient, or is that the job of a social worker? were indicative of confusion over the question of professional responsibility. Conversely, interviews also pointed to key potential facilitators. The most prominent was the demand for education and training, mentioned by 85% of nurses. Participants expressed a desire for practical, context-specific learning. "A concise training module on the major environmental risks in our region—dust, heat, water-borne issues—with clear assessment tools and patient counseling points would empower us immediately," one participant noted. Furthermore, 45% of nurses identified community partnership as a successful facilitator, often referencing past experiences with public health campaigns. A nurse from a PHC shared, "When we collaborated with a local mosque to disseminate information on heatstroke prevention, community engagement and compliance were visibly higher.



DISCUSSION

The research offers a new and combined evaluation of the environmental determinants of health in the Saudi setting and the respective nursing workforce capacity to deal with them. These results create a definite picture of a community that is painfully conscious of environmental hazards, and is in parallel with a healthcare subsystem that is still incapable of moving this consciousness into the organization of preventive action [15].

1. Discussion of Major Results

The first research objective is directly covered by the high community perception about the risk, which is especially in terms of air quality and heat. This is an important discovery since the level of seriousness in Riyadh is far greater than in Jeddah. This probably indicates the actual, common sense of harsh dust storms (shamal) and more drastic changes in extreme temperatures in the continent in the center, but in Jeddah, the coastal climate can soften some of these sharp experiences [16]. This geographical difference highlights the fact that environmental factors are not universal, and effective health policies should be over-localized, which is often generalized in planetary health discourses.

The main issue that was found in the second objective is the existence of a notable gap between nursing knowledge and practice. The average scores on knowledge are consistent with the literature at the global level, which suggests that environmental

health is not a priority of traditional nursing programs [17]. The enhanced performance of the Primary Health Center (PHC) nurses is rational and positive. Their preventive-care, community-facing model is inherently in line with the principles of environmental health, indicating that they are an unexploited resource to use in surveillance and education of the population [18]. The most interesting finding is the positive and insignificant correlation between knowledge and practice ($R^2 = 0.176$).

The analysis of obstacles and enablers (Objective 3) demonstrated a pyramid of problems. The fact that the absence of protocols is the most prevalent barrier in particularly with novice nurses, is indicative of a critical systems failure. Without the standardization of guidelines, environmental health will be optional and not part of care [19]. The fact that the primary barrier is developed in response to experience, in that the primary barrier changes its form to become a barrier of time constraints as the experience increases, implies that, although knowledge and will are present, the reality of high-acuity and high-volume clinical workloads smothers preventive measures [20].

2. Comparison to the Past Research

The high level of interest in air quality in the community is correlated with significant amounts of epidemiological evidence in the Gulf Cooperation Council (GCC) region attributing respiratory and cardiovascular morbidity to the contribution of the particulate matter (PM10 and PM2.5) due to dust and fossil fuel combustion [21]. Likewise, the health threat of being exposed to heat corresponds to the increasing amount of literature on the health effects of urban heat islands in fast-developing desert cities. The fact that these perceptions are city-dependent results in the fact that our findings provide a needed nuance to regional research studies, which tend to generalize national data [22].

The phenomenon of the knowledge-practice gap that is observed among nurses is a reflection of the research outcomes on the application of evidence-based practice in clinical environments. This particular obstacle of the absence of protocols has been found in other areas, when nurses are supposed to implement new roles, like during the integration of mental health or palliative care [23]. This paper carries this realization to the emerging discipline of clinical environmental health. The discovered facilitator of the said community partnership underpins the concepts of community-based participatory research (CBPR), which has been effective in the campaigns promoting health enhancement, including tobacco cessation, diabetes management, and the identified possible pathway [24].

3. Scientific and Contextual Explanation

The biological ground of the issues of the community is well established. The PM inhaled causes inflammation and oxidative stress in the lungs, which worsens asthma and COPD. The sustained exposure to heat raises the core body temperature, which causes dehydration, electrolyte imbalance, and cardiovascular load, which raises the chances of heatstroke and death, especially in susceptible groups. Lack of nursing protocols is a failure in knowledge transfer [25]. Scientifically, systematic risk identification is to chance otherwise, without standardized environmental assessment tools (e.g., structured history questions about home ventilation, water sources, or occupational sun exposure) integrated into the clinical workflow, which undermines the early intervention [26].

4. Implications and Novelty of the Research

The main conclusion of this study is that further improvement of the nursing role in environmental health has two aspects in total: the development of single competencies and the transformation of systems within which nurses operate. This paper goes beyond the quick identification of a knowledge gap to the diagnostic identification of systemic blockers, i.e., protocol deficiency and workload, that inhibit the application of knowledge [27].

The originality of this work is in its convergent design, which is context-specific. Although the specialty of environmental health nursing is already well-known in Western society, the study marks the first attempt to conduct empirical research on the topic in a distinct cultural and environmental setting of Saudi Arabia and its healthcare system. It shows that the concepts that have global relevance have to be operationalized with the help of local realities, e.g., the centrality of PHCs and the environmental exposures of the Arabian Peninsula in particular. To industries and healthcare policymakers, the results can be used as an argument to formulate national environmental health nursing guidelines and incorporate the corresponding competencies into licensure and continuing educational standards as soon as possible.

CONCLUSION

This paper has shown that despite the apparent manifestation of high-risk environmental health in Saudi Arabia, specifically in terms of air quality and heat, the capacity of the nursing workforce to mitigate these challenges is limited. The level of knowledge among nurses was moderate, with intermittent transfer to practice because of systemic issues such as unstandardized protocols and time limits. The study has been effective in achieving its goals because it established the critical risk factors, evaluated the nursing competency, and clarified the barriers to implementation. The main scientific contribution of it is the first community in Saudi Arabia to integrate evidence that connects the community risk perception and nursing practice gaps. The next steps should be aimed at the creation of country-specific clinical guidelines and custom-made training programs to make nurses key players in environmental health promotion.

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