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Nurses' attitudes, practices, and barriers toward sustainability behaviors: a qualitative study

Mohamed Ali Zoromba^{1*} and Heba Emad EL-Gazar²

Abstract

Background The integration of sustainability into nursing practice is critical for addressing the environmental challenges posed by healthcare systems. Nurses, as frontline healthcare providers, are uniquely positioned to lead sustainability initiatives, though collaboration with other healthcare professionals is essential. However, nurses' engagement in sustainability behaviors is influenced by a complex interplay of attitudes, practices, barriers, and facilitators, which are not fully understood. This study aimed to explore nurses' attitudes, practices, and barriers and facilitators toward sustainability behaviors in clinical settings.

Methods The study employed a descriptive qualitative design. Data were collected through semi-structured interviews designed to explore participants' experiences in depth with 15 purposively sampled licensed staff nurses. The sample size was determined by data saturation. Thematic analysis was used to analyze the data. The study adhered to the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines.

Results Nurses viewed sustainability as an ethical responsibility linked to waste reduction and resource conservation, yet sustainability was often deprioritized due to immediate patient care demands. Sustainability behaviors included waste management and energy conservation, but inconsistent institutional policies and limited formal training posed significant challenges. Key barriers included organizational challenges, competing priorities, and lack of motivation, while facilitators such as leadership support, education, training, and teamwork emerged as critical enablers of sustainable practices.

Conclusion The study highlights the complex interplay between individual attitudes, institutional barriers, and enabling factors influencing sustainability in nursing. Nurses demonstrate an ethical inclination toward sustainability, but systemic challenges hinder their engagement. Leadership support, targeted training, and organizational policies are critical for fostering sustainable practices in clinical settings.

Implications for Practice Addressing identified barriers and leveraging facilitators can enhance sustainability behaviors among nurses. Tailored interventions, such as sustainability-focused education, leadership engagement, and policy reforms, are essential to empower nurses as leaders in environmental stewardship. Recognizing and supporting nurses' roles as environmental advocates is crucial for advancing sustainability in healthcare.

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Clinical trial number Not applicable

Keywords Nursing, Sustainability behaviors, Attitudes, Barriers, Facilitators, Qualitative research, Healthcare sustainability, Clinical settings

Introduction

Global health systems are increasingly recognizing the critical need to address environmental sustainability in healthcare practices. The United Nations' Sustainable Development Goals (SDGs) explicitly call for urgent actions to combat climate change and promote responsible consumption and production, placing sustainability at the forefront of global health priorities [1]. Healthcare systems contribute significantly to environmental degradation, with substantial carbon emissions, medical waste generation, and excessive resource utilization. For instance, the healthcare sector in the United States alone accounts for approximately 10% of the country's greenhouse gas emissions [2]. Addressing these challenges necessitates the adoption of sustainable practices across all levels of healthcare delivery.

Nurses, as the largest segment of the global healthcare workforce, are uniquely positioned to lead and implement sustainability initiatives. Their roles extend beyond direct patient care to encompass resource management, waste reduction, and advocacy for environmentally responsible policies [3]. However, the integration of sustainability into nursing practice remains inconsistent and poorly understood, particularly in regions where institutional support and resources are limited [4]. Nurses' engagement in sustainability behaviors is influenced by a complex interplay of personal attitudes, institutional policies, and external pressures, yet little is known about how these factors interact in real-world settings [5, 6].

Theoretical background and prior research

Sustainability in nursing encompasses ethical responsibility, environmental stewardship, and the integration of sustainable practices into clinical care. This framework aligns with the principles of environmental ethics, which advocate for responsible resource use and the minimization of harm to ecosystems [7]. Within the context of healthcare, sustainability is operationalized through behaviors such as waste reduction, energy conservation, and the adoption of environmentally friendly practices. The conceptual framework guiding this study draws on systems thinking, which recognizes the interdependence of individual, organizational, and systemic factors in shaping sustainability behaviors. Systems thinking provides a holistic lens to understand how nurses' actions are influenced by broader healthcare structures, policies, personal attitudes, and institutional support [8–10]. This approach is particularly relevant for examining sustainability in nursing, as it highlights the interconnectedness

of various elements within healthcare systems that either facilitate or hinder sustainable practices.

The study's thematic structure reflects three key constructs including;

- Attitudes - Nurses' perceptions of sustainability and its relevance to their professional roles.
- Practices - The behaviors and strategies nurses employ to promote sustainability in clinical settings.
- Barriers and Facilitators - The challenges and enabling factors influencing the adoption of sustainable practices.

This thematic structure is informed by the concept analysis developed by Anåker & Elf, (2014) [11], which provides a comprehensive framework for understanding sustainability in nursing. By exploring these constructs, the study aims to offer actionable insights for education, policy, and practice.

The healthcare sector's environmental impact has been extensively documented in recent literature, highlighting the urgent need for sustainable practices. Cristiano et al. (2024) reported that global healthcare systems contribute approximately 4.4% of net global greenhouse gas emissions, with resource-intensive practices such as single-use equipment and energy-intensive processes exacerbating the problem [12]. Studies from high-income countries, such as Sweden and the United Kingdom, have demonstrated the effectiveness of institutional policies and standardized protocols in reducing healthcare-related emissions and waste [13–15].

However, sustainability initiatives in low- and middle-income countries (LMICs) face unique challenges, including resource limitations, inadequate infrastructure, and competing health priorities [16]. Research by Gannon et al. (2022) in sub-Saharan Africa highlighted the difficulty of balancing sustainability goals with the urgent demands of under-resourced healthcare systems [17]. These findings underscore the importance of context-specific strategies for promoting sustainability in diverse healthcare settings.

Nurses play a critical role in implementing sustainability practices, yet their engagement is often hindered by a lack of training and institutional support. A systematic review by Yeboah et al. (2024) identified key barriers to sustainability in nursing, including insufficient education, lack of leadership support, and competing clinical priorities [18]. Similarly, Chung et al. (2024) found that while nurses generally view sustainability as a moral and

professional obligation, their ability to act on these beliefs is constrained by systemic challenges [19].

Research on nursing education has also highlighted gaps in preparing nurses for sustainability roles. Álvarez-Nieto et al. (2022) demonstrated the effectiveness of targeted workshops and educational interventions in increasing nurses' knowledge and confidence in implementing sustainable practices. However, these initiatives remain limited in scope and are often concentrated in high-income settings, leaving a significant gap in LMICs [20].

Organizational challenges, including inadequate policies and infrastructure, are among the most frequently cited barriers to sustainability in healthcare. Lu et al. (2023) emphasized the role of leadership in overcoming these challenges, noting that visible commitment from managers can significantly motivate staff to adopt sustainable behaviors [21]. Conversely, the lack of recognition or incentives for sustainability efforts often leads to low engagement among healthcare workers [14].

Facilitators of sustainability include education, teamwork, and leadership support. Studies have consistently shown that targeted training programs and collaborative initiatives, such as Green Teams, enhance the adoption of sustainable practices [22, 23]. Leadership support is particularly critical, as it fosters a culture of accountability and reinforces the importance of sustainability as a core organizational value [21].

Research gaps

Despite growing attention to sustainability in healthcare, significant gaps remain in understanding how nurses perceive and enact sustainable practices, particularly in the Middle Eastern context. While research has been conducted in high-income countries such as Sweden and the United Kingdom, the unique cultural, policy, and infrastructural dynamics of healthcare systems in the Middle East, including Saudi Arabia, have not been adequately explored. Existing studies often rely on quantitative methods, which may overlook the nuanced experiences and perspectives of healthcare workers in these settings. Furthermore, there is limited research on the interplay between individual attitudes, institutional policies, and systemic factors in shaping sustainability behaviors within the specific context of Middle Eastern healthcare systems. This study addresses these gaps by adopting a qualitative approach to explore nurses' lived experiences in public hospitals in Al-Kharj, Saudi Arabia, providing rich, context-specific insights into the barriers and facilitators of sustainability in nursing.

Aim of the study

The aim of this study is to explore and understand nurses' attitudes, practices, and barriers and facilitators toward

sustainability behaviors in clinical settings, with a particular focus on the unique contextual dynamics of public hospitals in Al-Kharj, Saudi Arabia. By adopting a qualitative approach, the study seeks to capture in-depth insights into nurses' experiences and perspectives within this Middle Eastern healthcare system, providing a foundation for developing targeted interventions and policies to promote sustainability in nursing. The selection of varied specialty hospitals in Al-Kharj Governorate, Saudi Arabia, as the study setting reflects its distinct healthcare environment, shaped by regional policies and cultural factors, which offers a valuable lens for examining sustainability practices in a high-income, Middle Eastern context. The findings contribute to the growing body of knowledge on environmental sustainability in healthcare, addressing critical gaps in understanding how nurses perceive and enact sustainable practices in understudied regions.

Study questions

1. How do nurses perceive and understand sustainability, and what role do they believe it plays in their professional practice?
2. What sustainability-related behaviors are nurses currently practicing, and what challenges hinder these practices in clinical settings?
3. What factors facilitate or motivate nurses to adopt sustainable practices, and how can these be leveraged to integrate sustainability into nursing policies and education?

Methods

Study design

The current study utilized a descriptive qualitative design to explore nurses' attitudes, practices, and barriers and facilitators toward sustainability behaviors. This design grounded in the constructivist paradigm, which emphasizes the subjective experiences of individuals and the meanings they construct from their interactions with the world. Constructivism posits that knowledge is co-constructed through social and cultural contexts, making it a suitable framework for exploring complex phenomena such as sustainability in nursing [24]. By focusing on nurses' experiences, the study seeks to uncover how they understand, interpret, and enact sustainability within their professional roles. The study adhered to the Consolidated Criteria for Reporting Qualitative Research COREQ guidelines [25].

Participants and setting

The study was conducted in King Khaled Hospital and Obstetric and Pediatric Hospital, the two public hospitals located in Al-Kharj, Saudi Arabia. These hospitals were

selected to represent both general and specialized clinical settings, allowing for a comprehensive exploration of sustainability practices across different patient populations and care environments. King Khaled Hospital serves a broad patient base, while Obstetric and Pediatric Hospital focuses specifically on obstetrics and pediatrics, providing an opportunity to examine how sustainability behaviors may vary across diverse clinical contexts within the same region.

A purposive sampling technique was employed to recruit 15 licensed staff nurses. Purposive sampling was selected over convenience sampling to ensure that participants could provide rich, in-depth insights into sustainability behaviors in nursing, based on their professional roles and experiences in clinical settings, which directly aligned with the study’s qualitative aims of exploring sustainability perspectives in healthcare. The inclusion criteria required participants to: be licensed staff nurses (i.e., qualified and registered to practice nursing), be on active duty during the study period, possess at least one year of professional nursing experience, ensuring sufficient exposure to clinical practices and potential sustainability-related challenges, and demonstrate a willingness to participate in the study.

No prior understanding of sustainability issues or sustainable healthcare practices was required for selection. This decision was made to capture a broad range of perspectives, including those of nurses who may not have been previously engaged with sustainability, thereby enriching the study’s exploration of how sustainability is

perceived and practiced in nursing. Nurses who declined participation were excluded from the study. The sample size was determined by data saturation, achieved when no new themes or insights emerged during subsequent interviews.

Semi-Structured interview guide

Data were collected using a semi-structured interview guide developed based on a review of the literature and tailored to the study’s objectives. The interview guide included open-ended questions to encourage detailed responses while allowing flexibility for participants to introduce new insights. Table 1: outlines the key categories, themes, and sample questions. The interview guide was piloted with two nurses to ensure clarity and relevance before formal data collection.

Data collection

Data were collected through semi-structured interviews conducted by researchers experienced in qualitative research. Interviews were held in private hospital settings to ensure confidentiality and comfort. Written informed consent was obtained from all participants prior to the interviews. Each session lasted approximately 60 min and was audio-recorded with participants’ consent. Field notes were taken during and after interviews to capture non-verbal cues and contextual details. These field notes were reviewed alongside the interview transcripts and included in the thematic analysis to provide a more comprehensive understanding of the data. Data collection

Table 1 Semi-Structured interview questions

Category	Question
Introduction	When you hear the term “sustainability in nursing,” what comes to mind? How familiar are you with the concept of sustainability in healthcare practices?
Attitudes	What does sustainability mean to you in the context of your nursing role? How important do you think sustainability is to the nursing profession? Why? Do you believe nurses have a responsibility to engage in sustainability practices? Why or why not?
Intentions	Can you share any personal goals or motivations related to promoting sustainability in your nursing practice? How do you perceive your role in addressing sustainability issues in healthcare? Have you participated in any initiatives or programs focused on sustainability in your workplace? If so, how did they influence you?
Practices	What sustainability-related behaviors do you currently engage in during your daily nursing activities? (e.g., reducing waste, conserving energy). Are there specific examples of how you or your team have implemented environmentally sustainable practices in patient care? In your view, what is the most effective sustainability practice you’ve witnessed in your workplace?
Barriers	What challenges do you face when trying to practice sustainability in your workplace? How do organizational policies or resource limitations impact your ability to engage in sustainability behaviors? Do you feel adequately supported by leadership or your team in adopting sustainable practices? Why or why not?
Facilitators	What has helped or motivated you to adopt sustainability practices in your work? Can you describe any policies, training, or resources provided by your organization that encourage sustainable behaviors? Are there any examples of leadership or team actions that positively influenced your sustainability efforts?
Future Directions	In your opinion, what changes or improvements could help promote sustainability among nurses in your workplace? What recommendations would you give to healthcare organizations to better integrate sustainability into nursing practices? If you could implement one policy or practice to improve sustainability in your workplace, what would it be?

continued until saturation was achieved, ensuring comprehensive coverage of the study objectives.

To ensure that patient care was not compromised during the interviews, all interviews were scheduled during nurses' off-duty hours or during periods when their patient care responsibilities were covered by other staff. This arrangement was coordinated with hospital management to maintain the continuity of care. Demographic data, including age, gender, years of experience, and educational background, were collected via a brief questionnaire administered prior to the interviews. This information was used to describe the sample and provide context for the findings, enhancing the interpretability of the qualitative data. The choice of semi-structured interviews was guided by their flexibility in exploring participants' experiences while maintaining a focus on the research questions, a method widely supported in qualitative research [26]. This approach allowed for both structured inquiry and the opportunity to delve into emergent themes.

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Thematic analysis

Thematic analysis, as outlined by Braun & Clarke, (2006), was employed to systematically analyze the qualitative data [27]. The process involved the following steps:

1. Familiarization with the data: Audio recordings were transcribed verbatim, and researchers immersed themselves in the data by repeatedly reading the transcripts.
2. Generating initial codes: Two researchers independently coded significant phrases and statements relevant to the study objectives.
3. Searching for themes: Codes were grouped into themes and subthemes that reflected patterns across the dataset.
4. Reviewing themes: Themes were refined and adjusted through multiple discussions to ensure they accurately represented the data.
5. Defining and naming themes: Clear definitions were developed for each theme and subtheme.

6. Producing the report: Thematic findings were synthesized, and illustrative quotes were selected to support the interpretation.

Data analysis was conducted using NVivo software to ensure systematic coding and theme organization. Regular meetings between researchers facilitated consensus, enhancing the trustworthiness and credibility of the findings, in line with Lincoln and Guba's (1985) evaluative criteria for qualitative research [28].

Demographic data collection and analysis

Demographic data, including age, gender, educational background, marital status, and years of professional experience, were collected via a brief questionnaire administered prior to the interviews. These variables were selected to provide a comprehensive description of the sample and to explore potential associations between demographic characteristics and sustainability behaviors. For instance, marital status was included to examine whether personal responsibilities outside of work might influence nurses' engagement with sustainability practices. Descriptive statistics (e.g., means, standard deviations, frequencies) were calculated to summarize the demographic characteristics of the participants.

Results

The participants in this qualitative study were nurses with a mean age of 28.72 years ($SD = 6.11$). The majority were female, representing 87.0% of the sample ($n = 13$). A significant proportion of participants, 67% ($n = 10$), held a Bachelor of Science in Nursing (BSc) degree, highlighting their educational background. Additionally, over half of the nurses were married (53.3%, $n = 8$). On average, participants had 6.4 years of professional nursing experience ($SD = 4.22$), reflecting a moderately experienced cohort.

Sample diversity and limitations

While the purposive sampling strategy aimed to capture a range of perspectives, the sample was drawn from two public hospitals in Al-Kharj, Saudi Arabia, which may limit the diversity of experiences represented. However, the study provides valuable insights into the specific context of sustainability behaviors in this setting, and the findings can serve as a foundation for future research in more diverse healthcare environments.

Category 1: Attitudes

Theme: Perceptions of sustainability in nursing

As Table 2 presents, the nurses demonstrated an evolving conceptual understanding of sustainability, primarily viewing it as an ethical responsibility involving the efficient use of resources. Participants commonly linked sustainability to waste reduction and conservation. One

Table 2 Categories, themes, and subthemes regarding to nurses' attitudes, practices, and barriers and facilitators toward sustainability behaviors

Category	Theme	Subtheme	Details
Attitudes	Perceptions of sustainability in nursing	Conceptual understanding	Nurses viewed sustainability as ethical and responsible resource use, linked to waste reduction and conservation.
		Personal relevance	Sustainability aligns with nurses' values, though some considered it secondary to patient care.
Practices	Responsibility toward sustainability	Ethical obligation	Nurses felt an ethical duty to advocate for sustainability as part of professional responsibility.
		Interdisciplinary collaboration	Collaboration with other professionals was emphasized to achieve sustainability goals.
	Current sustainability behaviors	Waste management	Efforts included segregating waste and minimizing single-use items despite inconsistent policies.
		Energy and resource conservation	Participants reported turning off unused equipment and conserving water as key practices.
		Gaps in sustainability practices	Nurses lacked formal training on sustainability, often relying on media or personal judgment.
Barriers and facilitators	Barriers to sustainability	Limited knowledge and training	Nurses lacked formal training on sustainability, often relying on media or personal judgment.
		Priority on patient care	Sustainability practices were deprioritized in high-pressure situations focused on patient needs.
		Organizational challenges	Lack of institutional policies, poor infrastructure, and inadequate support were significant barriers.
	Facilitators of sustainability	Competing priorities	Time constraints and staff shortages limited nurses' ability to engage in sustainable behaviors.
		Lack of motivation	Perceived lack of recognition or incentives for sustainability discouraged participation.
	Facilitators of sustainability	Leadership support	Visible leadership commitment and endorsement motivated sustainable practices.
		Education and training	Targeted training or workshops improved nurses' confidence in implementing sustainability practices.

nurse explained, “*Sustainability is about using resources wisely and not wasting materials unnecessarily. It's about doing our part to protect the environment while delivering care.*” (N3. F).

The personal relevance of sustainability varied among nurses. While many felt sustainability aligned with their core values, others perceived it as secondary to direct patient care. A participant remarked, “*I care about sustainability, but when I'm overwhelmed with patients, it's hard to prioritize it.*” (N9. F).

Theme: Responsibility toward sustainability

Nurses acknowledged their ethical obligation to advocate for sustainable practices, recognizing it as part of their professional duty. One participant stated, “*As nurses, we have a responsibility to think about how our actions impact the environment—it's part of caring for the community as a whole.*” (N1. F).

Collaboration with other healthcare professionals was emphasized under interdisciplinary collaboration. Nurses felt that sustainability goals could only be achieved through collective efforts. One nurse shared, “*It's not just about what I do; we need everyone—doctors, administrators, and support staff—to work together on this.*” (N5. F).

Category 2: Practices

Theme: Current sustainability behaviors

Nurses described various sustainability behaviors, particularly in waste management, such as segregating waste, minimizing single-use items, and ensuring proper

disposal. However, they noted inconsistent institutional policies as a challenge. A participant commented, “*I try to separate waste, but sometimes the bins aren't even labeled properly. It feels like a wasted effort.*” (N13. M).

In energy and resource conservation, nurses described actions like turning off unused equipment and conserving water during procedures. One nurse mentioned, “*I always make sure to turn off the lights and equipment in empty rooms. Every small step counts.*” (N8. F).

Theme: Gaps in sustainability practices

A significant gap identified was limited knowledge and training. Many nurses felt inadequately prepared to implement sustainable practices due to a lack of formal education. A participant reflected, “*I've never received training on sustainability; I just do what feels right based on what I've read or seen online.*” (N1. F).

The priority on patient care often overshadowed sustainability efforts, particularly in high-pressure environments. One nurse expressed, “*When you're short-staffed and handling critical cases, sustainability just doesn't make it to the top of the list.*” (N11. F).

Category 3: Barriers and facilitators

Theme: Barriers to sustainability

Nurses highlighted several organizational challenges, including inadequate infrastructure and weak policies. For example, one participant stated, “*We don't have the right tools or systems in place. It feels like the organization doesn't prioritize sustainability.*” (N6. F).

Competing priorities, such as time constraints and staff shortages, further hindered sustainability efforts. A nurse shared, *“There are so many tasks to complete in a day, and sustainability often feels like an extra burden.”* (N13. M).

Lack of motivation due to insufficient recognition or incentives was another barrier. One participant remarked, *“You don’t get acknowledged for trying to be sustainable, so many people don’t bother.”* (N2. F).

Theme: Facilitators of sustainability

Leadership played a critical role in supporting sustainability. Visible commitment from managers and administrators was highly motivating for nurses. A participant explained, *“When my manager talks about sustainability and leads by example, it makes me want to do more.”* (N14. M).

Education and training emerged as a key facilitator, with nurses expressing increased confidence after attending workshops or receiving targeted training. One nurse noted, *“The training I attended on green healthcare practices was eye-opening. It gave me practical steps I could take immediately.”* (N2. F).

Discussion

This study explored nurses’ attitudes, practices, and barriers and facilitators toward sustainability behaviors, yielding valuable insights into the perceptions and challenges faced by nurses in adopting sustainable practices.

Attitudes toward sustainability

Nurses in the current study demonstrated a developing understanding of sustainability, primarily viewing it as an ethical responsibility involving resource conservation and waste reduction. This aligns with findings by Chung et al., (2024) and Riedel, (2015), who emphasized that nurses perceive sustainability as a moral obligation closely tied to the principles of nursing care [5, 29]. However, this study also revealed variability in how nurses prioritize sustainability, with some participants viewing it as secondary to immediate patient care demands. Such competing priorities echo the findings of Yeboah et al., (2024), who noted that many nurses are aware of sustainability but struggle to integrate it into their daily responsibilities due to clinical pressures [18].

The perceived ethical obligation to promote sustainability emerged as key finding, with participants emphasizing their role in reducing the environmental impact of healthcare. This sense of responsibility reflects nurses’ attitudes toward sustainability as an integral part of their professional identity, aligning with studies that position nurses as pivotal agents in addressing environmental challenges [30–32]. The connection between responsibility and attitudes underscores nurses’ belief that their actions can contribute to broader ecological goals,

though this commitment is often tempered by practical constraints. Additionally, participants highlighted the need for interdisciplinary collaboration, mirroring findings that identify teamwork as essential for achieving sustainability goals [33, 34]. This study reaffirms that fostering collaboration across disciplines can enhance collective accountability and action toward sustainability in healthcare settings.

Sustainability practices

Participants described various sustainability behaviors, including waste segregation and energy conservation. These practices align with those reported by studies found that nurses in China engaged in similar actions to minimize resource wastage [22, 23]. However, the inconsistent implementation of institutional policies, as noted in this study, highlights a significant gap that contrasts with findings from Sweden, where standardized protocols for waste management facilitated more uniform practices [35]. This inconsistency underscores the importance of organizational commitment and infrastructure to support sustainable behaviors.

Gaps in sustainability practices

A lack of formal training emerged as a critical barrier to sustainability practices. This finding is consistent with the systematic review by Yeboah et al., (2024), which reported insufficient education and awareness as common barriers across diverse healthcare settings. In this study, nurses also highlighted the deprioritization of sustainability in high-pressure environments, echoing the findings mentioned similar challenges among school nurses in Pennsylvania [36, 37]. These findings suggest the need for tailored training programs that equip nurses with practical strategies for incorporating sustainability even in resource-limited or high-stress scenarios.

Barriers and facilitators to sustainability

Participants identified organizational challenges, competing priorities, and lack of motivation as major barriers. These findings highlighted the role of inadequate policies and infrastructure in hindering sustainable practices in Australian healthcare settings [38]. Similarly, competing demands and time constraints, as observed in this study, are consistent with Awada et al., (2023), who noted that workload pressures often take precedence over environmental considerations [39]. However, the lack of recognition or incentives for sustainability reported by participants in this study contrasts with findings from the UK, where initiatives like the NHS “Green Champions” program have effectively motivated staff to adopt sustainable behaviors [14]. Notably, while such structured programs provide incentives, sustainability efforts in many contexts—including those observed in

this study—often rely on the initiative, persistence, and commitment of individual nurses or small groups, even in the absence of formal recognition or institutional support. This suggests that grassroots efforts play a critical role in driving sustainability, particularly where systemic barriers persist.

Leadership support emerged as a crucial facilitator, with visible endorsement from managers significantly motivating nurses to engage in sustainable practices. This finding aligns with studies that reported ethical leadership positively influenced nurses' green behavior intentions [40–42]. Furthermore, research in advanced practice and change management underscores leadership support as an essential driver for successful implementation and maintenance of organizational change, including sustainability initiatives [43, 44]. For instance, Kotter (1996) emphasizes that strong leadership is critical for creating a vision and sustaining momentum for change, a principle applicable to fostering sustainable practices in healthcare settings [43]. Similarly, education and training were identified as key enablers, supporting the findings of Álvarez-Nieto et al. (2024), who demonstrated the effectiveness of sustainability-focused workshops in increasing nurses' confidence and competence in implementing sustainable practices [45]. Teamwork and peer support also played a significant role, reinforcing the importance of fostering a collaborative culture within healthcare organizations [44].

The findings of this study highlight the complex interplay between individual attitudes, institutional policies, and external pressures in shaping nurses' sustainability behaviors. While nurses are ethically inclined to engage in sustainable practices, systemic barriers such as insufficient training, lack of infrastructure, and competing priorities can limit their ability to act. Addressing these barriers requires a multi-faceted approach, including the development of targeted training programs, institutional support for sustainability initiatives, and recognition mechanisms to incentivize sustainable behaviors.

Furthermore, the role of leadership and teamwork in promoting sustainability cannot be overstated. Visible commitment from healthcare leaders and collaborative efforts among staff can create an environment conducive to sustainable practices. By fostering a culture of accountability and support, healthcare organizations can empower nurses to integrate sustainability into their daily routines effectively.

Study implications

The findings emphasise the need for healthcare organizations to provide practical tools and resources that enable nurses to integrate sustainable practices into their daily work. Moreover, fostering interdisciplinary collaboration can strengthen team-based approaches to achieving

sustainability goals, enhancing overall efficiency and accountability in clinical settings.

The findings underscore the importance of organizational policies that prioritize sustainability. Policymakers should develop and enforce guidelines that promote sustainable practices while addressing systemic barriers such as inadequate infrastructure and lack of incentives. Leadership plays a critical role in driving these initiatives; visible commitment from management can motivate staff and foster a culture of environmental stewardship. Additionally, recognizing and rewarding sustainability efforts can serve as a powerful motivator for nurses.

This exploratory study highlights the subjective perspectives of nurses, revealing key factors that must be considered and managed to embed sustainability within clinical practice. While the qualitative approach captures individual experiences and provides valuable insights compared to previous quantitative studies, the sample of 15 nurses from two public hospitals in Al-Kharj, Saudi Arabia, limits the range of perspectives represented. Nevertheless, focusing on this specific Middle Eastern context—an understudied high-income setting with unique cultural and infrastructural dynamics—contributes to addressing gaps in sustainability research beyond the predominantly high-income, Western-focused literature. This study thus serves as an initial step toward understanding sustainability in nursing within a distinct regional context, rather than fully representing LMICs broadly.

Future research can build on these findings by exploring sustainability in nursing from broader and more diverse perspectives. Longitudinal studies could investigate how attitudes and practices evolve over time and in response to targeted interventions. Expanding research to include other healthcare professionals could provide a more comprehensive understanding of interdisciplinary dynamics in sustainability. Comparative studies across different regions and healthcare systems can identify best practices and adaptable strategies for promoting sustainability in diverse contexts.

Strengths and limitations

This study provided an exploration of nurses' attitudes, practices, and barriers related to sustainability behaviors, leveraging the strengths of qualitative research to uncover nuanced insights. The use of semi-structured interviews enabled the researchers to capture a wide range of experiences and perspectives, ensuring the richness of the data. Additionally, the focus on public hospitals in Saudi Arabia, addresses a significant gap in sustainability research within a Middle Eastern context.

Despite its contributions, the study had several limitations. The findings are context-specific and may not be generalizable beyond the two public hospitals studied.

This limitation is further compounded by the relatively small sample size of 15 participants. The reliance on self-reported data introduces the potential for social desirability bias. Finally, the study captured perspectives at a single point in time, which may not reflect changes in attitudes, practices, or barriers over time. Future research should consider longitudinal approaches to address this limitation and provide a more dynamic understanding of sustainability in nursing.

Conclusion

This study provided valuable insights into nurses' attitudes, practices, and barriers and facilitators toward sustainability behaviors in clinical settings. It underscored the predisposition of nurses to engage in sustainability efforts, yet highlights systemic barriers such as inadequate organizational policies, competing priorities, and limited training that hinder their full participation. The findings reaffirm the need for leadership support, targeted education, and institutional reforms to promote sustainable practices in healthcare environments. By addressing these barriers and leveraging identified facilitators such as teamwork, leadership engagement, and training, healthcare organizations can empower nurses to become active agents of environmental stewardship. Furthermore, the study highlights the importance of a collaborative, interdisciplinary approach to sustainability, advocating for the integration of sustainable practices into nursing education, policies, and daily operations. Future research should explore longitudinal changes in sustainability behaviors and expand the focus to include other healthcare professionals to create a more comprehensive strategy for sustainable healthcare practices.

Acknowledgements

The authors extend their appreciation to Prince Sattam bin Abdulaziz University for funding this research work through the project number (PSAU/2024/03/31232). Authors would like to thank all of the responded nurses for their cooperation.

Author contributions

MAZ and HEE planned the study and analyzed the literature. MAZ and HEE were major contributors in writing the results section, the discussion section, and in revising the manuscript by adapting reviewers' comments. Both authors gave final approval of the version to be published and agreed to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Funding

The authors extend their appreciation to Prince Sattam bin Abdulaziz University for funding this research work through the project number (PSAU/2024/03/31232).

Data availability

Upon request for scientific purposes, the researcher of correspondence will provide researchable information of the research.

Declarations

Ethical consideration and participation informed consent

for this study was obtained from the committee of bioethics research, Prince Sattam bin Abdulaziz University (No. 351/2024). The study adhered to the principles of the Declaration of Helsinki, ensuring participants' autonomy, confidentiality, and voluntary participation. Written informed consent was obtained from all participants, outlining their right to withdraw at any time without repercussions. Their consent was written and obtained only after confirming their comprehension and willingness to participate. Audio recordings and transcripts were anonymized and stored securely on encrypted devices, accessible only to the research team.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Received: 19 January 2025 / Accepted: 21 March 2025

Published online: 18 April 2025

References

1. United Nations. Health - United Nations Sustainable Development. 2015. <http://www.un.org/sustainabledevelopment/health/>. Accessed 31 Oct 2024.
2. Or Z, Seppänen A-V. The role of the health sector in tackling climate change: A narrative review. *Health Policy (New York)*. 2024;143:105053.
3. Bueser T. International Nurses Day 2024: the economic power of care. 2024.
4. Wang B-L, Batmunkh M-U, Samdandash O, Divaakhud D, Wong W-K. Sustainability of nursing leadership and its contributing factors in a developing economy: A study in Mongolia. *Front Public Heal*. 2022;10:900016.
5. Chung SJ, Lee H, Jang SJ. Factors affecting environmental sustainability attitudes among nurses— Focusing on climate change cognition and behaviours: A cross-sectional study. *J Adv Nurs*. 2024;April:1–12.
6. El-Gazar HE, Baghdadi NA, Abdelaliem SMF, Zoromba MA. Sparking nurses' creativity: the roles of ambidextrous leadership and psychological safety. *BMC Nurs*. 2024;23:1–9.
7. Shaban MM, Alanazi MA, Mohammed HH, Mohamed Amer FG, Elsayed HH, Zaky ME, et al. Advancing sustainable healthcare: a concept analysis of eco-conscious nursing practices. *BMC Nurs*. 2024;23:660.
8. Vasileiou A, Sfakianaki E, Tsekouropoulos G. Exploring sustainability and efficiency improvements in healthcare: A qualitative study. *Sustainability*. 2024;16.
9. Peters DH. The application of systems thinking in health: why use systems thinking? *Heal Res Policy Syst*. 2014;12:51.
10. Thelen J, Sant Fruchtmann C, Bilal M, Gabaake K, Iqbal S, Keakabets T et al. Development of the systems thinking for health actions framework: a literature review and a case study. *BMJ Glob Heal*. 2023;8.
11. Anâker A, Elf M. Sustainability in nursing: A concept analysis. *Scand J Caring Sci*. 2014;28:381–9.
12. Cristiano W, De Marchi C, di Domenico K, Punzo O, Mancini A, Mancini L. The elephant in the room in greenhouse gases emissions: rethinking healthcare systems to face climate change. A rapid scoping review. *Environ Sci Eur*. 2024;36:24.
13. Hough E, Cohen Tanugi-Carresse A. Supporting decarbonization of health Systems-A review of international policy and practice on health care and climate change. *Curr Environ Heal Rep*. 2024;11:266–78.
14. NHS. Our Strategy towards Net Zero. 2022.
15. Mirow J, Venne J, Brand A. Green health: how to decarbonise global health-care systems. *Sustain Earth Rev*. 2024;7:28.
16. El-Gazar HE, Abousoliman AD, Shawer M, Coelho P, Zoromba MA. How nursing practice environments limit implicit rationing of care and nurse-assessed adverse events: the role of flow at work. *BMC Nurs*. 2024;23:1–11.

17. Gannon KE, Pettinotti L, Conway D, Surminski S, Ndilanha E, Nyumba T. Delivering the sustainable development goals through development corridors in East Africa: A Q-Methodology approach to imagining development futures. *Environ Sci Policy*. 2022;129:56–67.
18. Yeboah E, Adegboye ARA, Kneafsey R. Nurses' perceptions, attitudes, and perspectives in relation to climate change and sustainable healthcare practices: A systematic review. *J Clim Chang Heal*. 2024;16.
19. Chung SJ, Jang SJ, Lee H. Validation of the sustainability attitudes in nursing Survey-2 for nurses: A cross-sectional study. *Nurse Educ Pract*. 2024;75(December 2023):103898.
20. Álvarez-Nieto C, Richardson J, Navarro-Perán MÁ, Tutticci N, Huss N, Elf M, et al. Nursing students' attitudes towards climate change and sustainability: A cross-sectional multisite study. *Nurse Educ Today*. 2022;108:105185.
21. Lu Y, Zhang MM, Yang MM, Wang Y. Sustainable human resource management practices, employee resilience, and employee outcomes: toward common good values. *Hum Resour Manage*. 2023;62:331–53.
22. Ferreira MJC, Ventura CAA, Valadares GV, Silva TP, da Silva LJ da, Silva ÍR. Complexities of nursing in healthcare waste management in hospitals. *Rev Bras Enferm*. 2024;77:e20230391.
23. Okonkwo CU, Liyuan L, Jianbo G, Wang T, Meng C, Qinzhong F et al. Review on medical waste management in China and Nigeria. *Waste Manag & Res*. 2024;0:0734242X241271018.
24. Burns M, Bally J, Buries M, Holtslander L, Peacock S. Constructivist grounded theory or interpretive phenomenology? Methodological choices within specific study contexts. *Int J Qual Methods*. 2022;21:16094069221077758.
25. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Heal Care*. 2007;19:349–57.
26. Smith JA. *Qualitative psychology: A practical guide to research methods*. SAGE; 2016.
27. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3:77–101.
28. Lincoln YS, Guba EG. *Naturalistic inquiry*. Sage; 1985.
29. Riedel A. Sustainability as an Ethical Principle: Ensuring Its Systematic Place in Professional Nursing Practice. *Healthc (Basel, Switzerland)*. 2015;4.
30. Atta MHR, Zoromba MA, El-Gazar HE, Loutfy A, Elsheikh MA, El-ayari OSM, et al. Climate anxiety, environmental attitude, and job engagement among nursing university colleagues: a multicenter descriptive study. *BMC Nurs*. 2024;23:133.
31. Atta MHR, Zoromba MA, Asal MGR, Abdelhay ES, Hendy A, Sayed MA et al. Predictors of climate change literacy in the era of global boiling: a cross-sectional survey of Egyptian nursing students. *BMC Nurs*. 2024;23.
32. El-Gazar HE, Abousoliman AD, Shawer M, Coelho P, Zoromba MA. How nursing practice environments limit implicit rationing of care and nurse-assessed adverse events: the role of flow at work. *BMC Nurs*. 2024;23.
33. El-Gazar HE, Zoromba MA. Nursing human resource practices and hospitals' performance excellence: the mediating role of nurses' performance. *Acta Bio Med Atenei Parm*. 2021;92 Suppl 2.
34. Zoromba MA, Abousoliman AD, Zakaria AM, El-Monshed AH, El-Gazar HE. Mistreatment of nurses by patients and its impact on their caring behaviors: The roles of psychological detachment and supervisor positive gossip. *Int Nurs Rev*. 2024;n/a n/a.
35. Zhang Y, Bashiri P, Browne M. An investigation into Swedish E-waste collection and recycling system A case study in Gothenburg. 2017.
36. Buchan J, Catton H, Schaffer FA. Sustain and retain in 2022 and beyond: the global nursing workforce and the Covid-19 pandemic. *Int Counc Nurses*. Jan 2022:1–71.
37. Luque-Alcaraz OM, Aparicio-Martínez P, Gomera A, Vaquero-Abellán M. The environmental awareness of nurses as environmentally sustainable health care leaders: a mixed method analysis. *BMC Nurs*. 2024;23:229.
38. Aboueid S, Beyene M, Nur T. Barriers and enablers to implementing environmentally sustainable practices in healthcare: A scoping review and proposed roadmap. *Healthc Manag Forum*. 2023;36:405–13.
39. Awada M, Becerik-Gerber B, Liu R, Seyedrezaei M, Lu Z, Xenakis M, et al. Ten questions concerning the impact of environmental stress on office workers. *Build Environ*. 2023;229:109964.
40. El-Gazar HE, Zoromba MA. Ethical leadership, flourishing, and Extra-Role behavior among nurses. *SAGE Open Nurs*. 2021;7:23779608211062668.
41. El-Gazar HE, Baghdadi NA, Abdelaliem SMF, Zoromba MA. Linking ethical leadership to nurses' internal whistleblowing through psychological safety. *Nurs Ethics*. 2024. <https://doi.org/10.1177/09697330241268922>.
42. Zoromba MA, Abualruz H, Abu Sabra MA, Zoromba MA, El-Gazar HE. Decent work and ethical ideologies of nurses-A multicenter cross-sectional study. *Nurs Ethics*. 2024;9697330241262472.
43. Kotter JP. *Leading change*. Harvard business. 2012.
44. Sabri S, Sabri-Matanagh S. *Organizational development and strategic change*. Academics Publishing. 2013.
45. Álvarez-Nieto C, Parra-Anguita L, Álvarez-García C, Montoro Ramirez EM, López-Franco MD, Sanz-Martos S, et al. Sustainability education in nursing degree for climate-smart healthcare: a quasi-experimental study. *Int J Sustain High Educ*. 2024;25:278–92.

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