The Impact of Environmental Factors on Patient Safety in Hospitals

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Abstracts

This study aimed to identify the main environmental factors that affect patient safety, assess the impact of these factors on patient safety, investigate how environmental factors influence the improvement of positive treatment experiences for patients, and provide key recommendations for improving environmental factors in hospitals. The descriptive analytical method was used, with a sample consisting of 150 inpatients from hospitals in Jeddah, Saudi Arabia. A questionnaire was developed to collect the data. The results revealed that environmental factors such as air quality, noise levels, lighting, and cleanliness have a significant impact on patient safety. Key findings included the importance of proper ventilation and air quality in enhancing patient comfort and respiratory health, the critical role of cleanliness and effective disinfection in preventing infections, and the positive influence of a quiet and well-lit environment on reducing patient stress and improving overall patient safety. Based on the study's findings, several recommendations were formulated, the most important of which were: enhancing ventilation and air conditioning systems in hospitals to ensure air quality and reduce pollutants that may affect patients' health.

Keywords: Environmental Factors, Patient Safety, Hospitals, Quality of Healthcare.

1. Introduction

Patient safety in hospitals is crucial to ensuring the quality of healthcare and the success of treatment. Any shortcomings in this aspect can lead to serious complications that may jeopardize patient safety (Bailey, Tickle & Campbell, 2014). Therefore, healthcare institutions must prioritize the creation of a safe and healthy environment that supports healing and protects patients from infections, medical errors, and other risks (Patel & Smith, 2021).

Recently, the focus on patient safety in hospitals has become a critical issue in healthcare management. This concern goes beyond providing effective medical treatments to include the surrounding environment, which plays a significant role in determining the quality of health outcomes (Balestracci et al., 2023). Environmental factors, whether physical, biological, or chemical, can have a direct or indirect impact on patient safety (Al-Zahrani, 2020).

Environmental factors are among the critical aspects that must be considered to ensure patient safety within hospitals (Banja, 2019). They encompass everything from air quality and cleanliness of facilities to noise control and adequate lighting. Careful supervision of these factors can reduce the spread of infections, alleviate stress and anxiety in patients, and promote faster recovery (Rees et al., 2017). For this reason, it is essential to implement strict maintenance protocols and conduct regular inspections to ensure that all systems are operating efficiently and that the environment surrounding patients effectively supports healthcare objectives (Salvador et al., 2017).

The healthcare environment plays a significant role in preventing infections. Maintaining cleanliness and safety of the facilities greatly reduces the risks of transmitting infectious diseases (Sehgal, & Kritek, 2018). Additionally, the management of medical waste, continuous sterilization of tools and equipment, and disinfecting surfaces with effective materials are all vital elements that contribute to creating an environment free from contaminants that could harm patient health (MacFarlane et al., 2022). Procedures must also be clear and strictly followed by all staff members to ensure the highest levels of safety and cleanliness, ultimately providing safe and effective healthcare (Bergs et al., 2021).

The healthcare environment also contributes to providing proper care. A clean and organized environment enhances the medical staff's ability to perform their tasks efficiently and effectively (Moffatt-Bruce, 2019). Furthermore, improving organization within the hospital allows staff to quickly access necessary tools and equipment, accelerating the delivery of medical services and improving the quality of care provided (Motamedi, Degeling & Carter, 2024). This ideal environment also reduces stress and psychological pressure on staff, which helps enhance focus and accuracy in performing medical procedures and interacting with patients (Brennan, Jarvis & Oeppen, 2022).

The healthcare environment is also an important factor in improving patients' positive treatment experience, as it helps create a comfortable atmosphere that enhances patients' comfort and trust in the care provided (Jackson & Lopez, 2019). Clean, well-equipped, and quiet rooms help

patients relax and promote faster healing. Additionally, attention to the details of the healthcare environment demonstrates to patients that the institution values their health and comfort, which increases their satisfaction with the medical services provided and enhances treatment success rates (Gutberg, & Berta, 2017).

A positive treatment experience for patients is a critical factor in enhancing healthcare outcomes (Thompson, & Jones, 2017). Healing is influenced not only by the quality of medical treatment provided but also by the supportive environment in which the patient receives this care (Jeong et al., 2021). A sense of safety, comfort, and understanding from the medical team significantly improves patients' morale, motivating them to engage more actively during the treatment period (Kim & Jeong, 2021). A positive treatment experience also involves effective communication between patients and healthcare providers, ensuring a clear understanding of prescribed treatments and health expectations (Liu et al., 2022).

Among the previous studies related to the current research topic, Wami et al. (2016) assessed the patient safety culture in hospitals in Southwest Ethiopia. The study revealed that the overall level of patient safety culture was 46.7%, with significant influences from working hours, communication quality, and teamwork. Beghè et al. (2017) examined the prevalence of sarcoidosis in Italy and its relationship with environmental pollution, finding a high but heterogeneous prevalence without establishing a clear causal link between pollution and the disease. Salvador et al. (2017) analyzed YouTube videos on patient safety and found that the videos lacked scientific depth and credibility, highlighting the need for improved digital content to enhance public awareness of patient safety. Karami & Hafizi (2017) explored the role of medical informatics in enhancing patient safety in the medical imaging department by reducing medication and radiation errors and improving medical decision-making through better access to information. Litchfield et al. (2018) examined the factors influencing the adoption of patient safety innovations in primary care, finding that management support, awareness, and resource availability are key factors, and recommended removing organizational barriers to improve patient safety. Bradley et al. (2018) focused on the impact of environmental pollutants on amyotrophic lateral sclerosis (ALS) and demonstrated the effectiveness of L-serine in slowing disease progression by 34%. Meanwhile, Abaro (2018) evaluated the health insurance experience, emphasizing the importance of proximity to service centers for achieving social justice, while highlighting challenges such as difficulty in obtaining insurance cards. The study by Al-Amri & ALMendeil (2020) aimed to explore nurses' perceptions of patient safety culture at King Khalid University Hospital in Saudi Arabia. The results showed an increased awareness of the importance of patient safety, with challenges such as resource shortages and work pressure. Meanwhile, Brubakk et al. (2021) focused on the impact of hospital work environments on the patient safety climate. The findings highlighted that improving the work environment, such as enhancing communication and supporting staff, positively contributes to improving the patient safety climate. The study by Al-Janabi and Awad (2021) focused on improving the healthcare customer experience, highlighting the importance of social and physical environments in enhancing both cognitive and emotional experiences. Meanwhile, the study by Tambal et al. (2021) aimed to assess the quality of performance at Bashayer University Hospital, with recommendations for improving cleanliness and reducing waiting times. The study by Kaware et al. (2022) explored patient safety culture in Nigerian hospitals, finding that a positive work

environment and managerial support were key factors, while long working hours and resource shortages had a negative impact. Similarly, Hwang et al. (2023) utilized deep learning algorithms to predict asthma patient numbers, demonstrating the significant role of air pollution and influenza in exacerbating the condition, and recommended applying these models in health policy making. The study by Binkheder et al. (2023) aimed to explore the relationship between patient safety culture and sentinel events in Saudi hospitals, showing that strengthening patient safety culture significantly reduces these events. The study recommended improving the work environment, implementing training programs, and enhancing organizational policies to support patient safety. The study by Shahrestanaki et al. (2023) aimed to explore patient safety factors in home healthcare using grounded theory methodology. The results highlighted the importance of training caregivers, improving communication with patients, and ensuring resource availability to ensure patient safety. The study emphasized the need for integrating environmental and organizational factors to enhance home care. The study by Kim et al. (2024) focused on patient safety and advocated for the application of the "C.A.R.E" methodology to improve decision-making and reduce medical errors. The study stressed that intuitive thinking can lead to cognitive biases and recommended using tools such as the TWED checklist and the Japanese "Shisa Kanko" method to enhance accuracy and patient safety in clinical settings. The study by Al-Nawafleh et al. (2024) assessed the effectiveness of patient safety education for Jordanian nursing students, with results showing significant improvements in their knowledge and skills following the educational intervention.

In light of the above, the current research will focus on examining the impact of environmental factors on patient safety in hospitals, exploring how these factors contribute to enhancing the quality of care provided.

Problem Statement:

Environmental factors within hospitals, such as air quality, noise, lighting, and facility cleanliness, have both direct and indirect effects on patient safety and treatment outcomes. Despite the strict measures implemented in hospitals to ensure the quality of care, there may be insufficient focus on how these environmental factors influence patient health, posing a significant risk to their safety.

A noticeable disparity exists in the environmental safety standards between different hospitals, leading to variations in infection rates and other environment-related diseases. This discrepancy suggests a gap between theory and practice, highlighting the need for an in-depth study to identify effective means of improvement.

Current policies in some hospitals may lack comprehensiveness, failing to cover all environmental aspects that impact patient safety. This calls for the development and updating of protocols to include the latest research and advancements in the field of environmental healthcare, necessitating accurate and continuous evaluation.

Furthermore, environmental factors also affect the medical staff's ability to provide effective care. Stress caused by poor environments can reduce staff efficiency, accuracy, and overall performance, which, in turn, negatively impacts patient safety.

The researcher has observed, through reviewing previous studies, a lack of research directly linking environmental improvements to enhanced healthcare outcomes. This highlights the need for experimental studies that explore the causal relationship between improving the healthcare environment and its impact on patient health outcomes, enabling the formulation of evidence-based recommendations.

Research Questions:

1. What are the main environmental factors that affect patient safety within hospitals?

2. What is the impact of environmental factors on patient safety in hospitals?

3. What environmental factors influence the improvement of positive treatment experiences for patients?

4. What are the key recommendations for improving environmental factors in hospitals?

Study Objective:

The main objective of this study is to investigate the impact of environmental factors on patient safety in hospitals.

Study Hypotheses:

1. Environmental factors such as air quality, noise levels, lighting, and general cleanliness influence patient safety within hospitals.

2. Improving environmental factors within hospitals leads to a reduction in infection rates and complications among patients.

3. Environmental factors such as adequate lighting, room cleanliness, and the availability of green spaces within hospitals enhance the positive treatment experience for patients and contribute to improved healing outcomes.

4. Implementing recommendations based on the latest research on environmental safety within hospitals can lead to tangible improvements in patient safety and satisfaction.

Significance of the Study:

1. Scientific Importance:

- The scientific importance of this study lies in its contribution to bridging the knowledge gaps regarding the impact of the internal environment of hospitals on health and safety. Although numerous studies have examined various aspects of healthcare, a deeper understanding of how factors such as noise, air quality, and cleanliness affect patient outcomes still requires further exploration.

- Advancing scientific research in this field is crucial for developing effective intervention models aimed at improving the health environment within hospitals. By investigating the causal relationships between environmental factors and patient safety, the study contributes to creating a foundation for policy and procedural guidelines that can enhance the quality of healthcare provided.

- This study contributes to fostering collaboration between various disciplines. A comprehensive understanding of how environmental factors interact can lead to innovations in hospital design and management, ultimately benefiting the therapeutic environment as a whole.

- The study also raises awareness of the importance of environmental safety in hospitals among policymakers and healthcare professionals by providing scientific evidence that demonstrates the direct impact of the environment on health outcomes.

2. Practical Significance:

- This study provides evidence on how improvements such as enhancing air quality and controlling noise can reduce the risks of infections and other complications, contributing to the efficiency of healthcare services.

- The study highlights the need for clear policies and standards related to environmental safety in hospitals. By identifying and analyzing the impacting environmental factors, healthcare institutions can develop and implement protocols that focus on maintaining a healthy and safe therapeutic environment, ensuring the provision of high-quality healthcare.

- Improving the internal environment of hospitals directly affects patient satisfaction and their therapeutic experience. The comfort and safety that a patient feels within the healthcare facility can enhance their confidence in the treatment provided, encouraging cooperation with the medical staff, which leads to positive outcomes for the overall treatment process.

- Investing in improving environmental factors can lead to long-term reductions in medical costs. By preventing infections and reducing the length of patient stays in hospitals, healthcare institutions can minimize expenses related to complications and readmissions, thereby enhancing resource utilization efficiency.

- The study also works to enhance training and awareness among healthcare workers about the importance of environmental factors and their role in patient safety. By providing practical tools and information to healthcare professionals, the study contributes to building an institutional culture that values and strives to maintain a high-quality healthy environment.

Study Terms and Concepts:

1. Environmental Factors:

In the context of this research, environmental factors are defined operationally as all the physical elements and conditions within the hospital environment that can directly or indirectly affect the safety and well-being of patients. This definition includes several key aspects, such as:

- Air Quality: Includes ventilation levels and the presence of airborne pollutants or harmful gases within the hospital.

- Lighting: Involves appropriate lighting levels required to facilitate healthcare delivery and provide visual comfort to patients.

- Sanitation and Sterilization: Focuses on cleaning practices and measures aimed at reducing infection and the spread of germs within the hospital.

- Noise: Encompasses sound levels within the hospital that may affect patients' ability to rest and relax, as well as impacting privacy and tranquility.
- Physical Safety: Covers factors such as ensuring obstacle-free corridors, providing functional and easily usable safety equipment, and building features that support the vital functions of healthcare delivery.
- Spatial Planning and Room Design: Considers the spatial distribution and room layouts within the hospital as important factors influencing patient experience and the ease of healthcare delivery.

2. Patient Safety:

Within the framework of this research, patient safety is defined operationally as the condition in which potential harm to patients is minimized to the lowest possible level during their receipt of healthcare services within hospitals.

Study Limitations:

1. Thematic Limitations: The study is limited to examining the impact of environmental factors within hospitals, such as air quality, noise levels, lighting, and general cleanliness, on patient safety.

2. Human Limitations: The study is confined to inpatients in hospitals in Jeddah, Saudi Arabia, during the period of the current study.

3. Temporal Limitations: The field study was conducted in the year 1445 AH, corresponding to 2024 CE.

4. Spatial Limitations: The field study was conducted in hospitals located in the city of Jeddah, Saudi Arabia.

2. Study Methodology:

1. Study Method:

The study adopted a descriptive analytical approach, which allows for examining and analyzing the environmental factors affecting patient safety. This method is suitable for measuring current phenomena and analyzing the relationships between variables in a natural setting without intervention. It also aids in collecting accurate data on the current situation and the influencing factors, while the analysis can be used to infer causal and impact relationships.

2. Study Population:

The study population includes all inpatients in hospitals located in Jeddah, Saudi Arabia, during the period of the current study. This population provides a diverse range of health conditions and environmental circumstances, which helps in obtaining comprehensive and representative results.

3. Sample of the Study:

The study sample consisted of 150 patients who were selected using a stratified random cluster sampling method. The hospitals were divided into strata based on criteria such as size and type of services provided. Random samples were then chosen from each stratum, ensuring comprehensive coverage of the various environmental factors in different types of hospitals.

4. Study Instrument:

The questionnaire was used as a tool for data collection in the current research, as it is suitable for the research topic and helps achieve its objectives and answer its research questions. This questionnaire was prepared in light of the theoretical literature on the topic and based on the tools used in previous studies. The questionnaire consists of 24 statements distributed across four sections: The first section (environmental factors affecting patient safety in hospitals) includes 7 statements; the second section (the impact of environmental factors on patient safety in hospitals) includes 6 statements; the third section (environmental factors influencing the improvement of patients' positive treatment experience) includes 6 statements; and the fourth section (the most important suggestions for improving environmental factors in hospitals) includes 5 statements. A five-point Likert scale was used, where respondents rate each statement by indicating their level of agreement, choosing one of the following options: (Very High, High, Medium, Low, Very Low). These options were assigned the scores (5, 4, 3, 2, 1) respectively. To determine the level of agreement of the research sample with each statement and each section, the range of scores for each statement was calculated. The range of response = (Highest score – Lowest score) / number of categories = (5-1) / 5 = 0.80, which is the category width. Accordingly, if the mean score for a statement falls between (4.2) and (5), the level of agreement with that statement by the research sample is very high. If the mean score for the statement falls between (3.4) and less than (4.2), the level of agreement with that statement is high. If the mean score for the statement falls between (2.6) and less than (3.4), the level of agreement with that statement is medium. If the mean score for the statement falls between (1.8) and less than (2.6), the level of agreement with that statement is low. If the mean score for the statement falls between (1) and less than (1.8), the level of agreement with that statement is very low.

- Validity of the Study Instrument:

The internal consistency validity of the questionnaire was verified by administering it to a pilot sample of 30 patients who were not part of the main research sample. Pearson's correlation coefficients were calculated between the score of each item, the score of the corresponding domain, and the total score of the questionnaire. Additionally, Pearson's correlation coefficients were calculated between the score of each domain and the total score of the questionnaire. The correlation values ranged from 0.64 to 0.88, all of which were statistically significant at the 0.01 level, indicating an appropriate level of internal consistency for the questionnaire.

- Reliability of the Study Instrument:

The researcher administered the questionnaire to the pilot sample, and Cronbach's alpha values were calculated for the entire questionnaire and for each domain. These values ranged from 0.89 to 0.94, all of which indicate high reliability coefficients

3. Study Results:

1. Results of the first question:

The first question is: What are the main environmental factors that affect patient safety within hospitals? To answer this question, the means and standard deviations of the responses from the research sample members to the items of the first axis of the questionnaire (environmental factors affecting patient safety within hospitals) were calculated. The results were as follows:

Table (1) Mean Scores and Standard Deviations for the Items of Axis One (Environmental Factors Affecting Patient Safety within Hospitals)

No.	Item	Mean	Standard Deviation	Agreement Level	Rank
1	Air quality inside the hospital enhances patients' health comfort and helps improve their breathing.	4.13	0.83	High	4
2	A clean environment free from pollutants helps reduce the risk of infections and limit complications.	4.21	0.96	Very High	3
3	Good ventilation in medical departments contributes to creating a healthy and safe therapeutic environment.	4.49	0.71	Very High	1
4	Sufficient lighting contributes to improving visual comfort and increases the accuracy of medical procedures.	3.89	0.98	High	6
5	Controlling temperature and humidity helps increase patient comfort.	3.49	0.78	High	7
6	Providing an effective ventilation system in rooms helps renew air and reduce pollution.	3.97	0.85	High	5
7	An environment free from chemical pollutants ensures better health for patients.	4.24	0.72	Very High	2
Overall Mean for Axis One		4.06	0.36	High	

From Table (1), it is evident that the mean scores for the items in Axis One (Environmental Factors Affecting Patient Safety within Hospitals) ranged from 3.49 to 4.49. This axis received an overall mean of 4.06 with a standard deviation of 0.36, indicating a high level of agreement. Three items received a very high level of agreement, while four items received a high level of agreement. The item with the highest level of agreement was item number (3), which states, "Good ventilation within medical departments contributes to creating a healthy and safe therapeutic environment," with a mean of 4.49 and a standard deviation of 0.71. The item with the lowest level of agreement was item number (5), which states, "Controlling temperature and humidity helps increase patient comfort," with a mean of 3.49 and a standard deviation of 0.78.

2. Results of the second question:

The second question is: What is the impact of environmental factors on patient safety in hospitals? To answer this question, the arithmetic means and standard deviations of the responses

of the study sample were calculated for the items in the second axis of the questionnaire (The Impact of Environmental Factors on Patient Safety in Hospitals). The results were as follows:

Table (2) Mean Scores and Standard Deviations for the Items of Axis Two (Impact of Environmental Factors on Patient Safety in Hospitals)

No.	Item	Mean	Standard Deviation	Agreement Level	Rank
8	Continuous cleaning and disinfection reduce the risk of infection and enhance the therapeutic environment.	4.72	0.66	Very High	2
9	A quiet environment helps reduce stress and improve patients' mental comfort.	4.45	0.66	Very High	5
10	Optimal lighting helps improve the visual performance of medical teams, leading to better outcomes.	4.53	0.90	Very High	4
11	Maintaining cleanliness of surfaces and medical facilities helps reduce the risk of diseases.	4.39	0.79	Very High	6
12	Controlling noise contributes to enhancing patient comfort and reducing anxiety and stress.	4.60	0.69	Very High	3
13	A healthy and safe environment ensures a quick and effective response to treatment and improves recovery outcomes.	4.77	0.51	Very High	1
Overall Mean for Axis Two		4.58	0.36	Very High	

From Table (2), it is evident that the mean scores for the items of Axis Two (Impact of Environmental Factors on Patient Safety in Hospitals) ranged from (4.39 - 4.77), with this axis achieving a general mean of (4.58), a standard deviation of (0.36), and a very high level of agreement. All the items of this axis received a very high level of agreement. The highest-ranked item is statement number (13) which reads, "A healthy and safe environment ensures a quick and effective response to treatment and improves recovery outcomes," with a mean of (4.77) and a standard deviation of (0.51), while the lowest-ranked item is statement number (11) which reads, "Maintaining cleanliness of surfaces and medical facilities helps reduce the risk of diseases," with a mean of (4.39) and a standard deviation of (0.79).

3. Results of the third question:

The third question is: What environmental factors influence the improvement of positive treatment experiences for patients? To answer this question, the arithmetic means and standard deviations of the responses of the study sample were calculated for the items in the third axis of the questionnaire (environmental factors influencing the improvement of positive treatment experiences for patients). The results were as follows:

Table (3) Mean Scores and Standard Deviations for the Items of Axis Three (Environmental Factors Influencing the Improvement of Positive Treatment Experiences for Patients)

No.	Item	Mean	Standard Deviation	Agreement Level	Rank
14	Providing a quiet and clean environment contributes to improving relaxation and rapid recovery.	4.29	0.85	Very High	5
15	Green spaces in the hospital enhance mental comfort and aid in healing.	4.18	0.86	High	6
16	The design and organization of the hospital contribute to improving patient comfort and ease of access to services.	4.41	0.83	Very High	4
17	Effective communication in a comfortable environment helps increase trust between patients and the care team.	4.51	0.71	Very High	3
18	Patient comfort in a clean and safe environment contributes to improving their treatment experiences.	4.54	0.71	Very High	2
19	Providing a sterile and safe environment reduces anxiety and enhances the positive experience of patients.	4.63	0.55	Very High	1
Overall Mean for Axis Three		4.43	0.34	Very High	

From Table (3), it is evident that the means for the items in Axis Three (environmental factors influencing the improvement of positive treatment experiences for patients) ranged between 4.18 and 4.63. The overall mean for this axis was 4.43, with a standard deviation of 0.34, indicating a "Very High" degree of agreement. Five items received a "Very High" level of agreement, while one item received a "High" level of agreement. The highest-ranked statement in this axis was item number 19, which states "Providing a sterile and safe environment reduces anxiety and enhances the positive experience of patients" with a mean of 4.63 and a standard deviation of 0.55. The lowest-ranked statement was item number 15, "Green spaces in the hospital enhance mental comfort and aid in healing," with a mean of 4.18 and a standard deviation of 0.86.

4. Results of the fourth question:

The fourth question is: What are the key recommendations for improving environmental factors in hospitals? To answer this question, the arithmetic means and standard deviations of the responses of the study sample were calculated for the items in the fourth axis of the questionnaire (Suggestions for Improving Environmental Factors in Hospitals). The results were as follows:

Table (4) Mean Scores and Standard Deviations for the Items of Axis Four (Suggestions for Improving Environmental Factors in Hospitals)

No.	Item	Mean	Standard Deviation	Agreement Level	Rank
20	Improving air quality inside the hospital by enhancing ventilation effectively.	4.26	0.79	Very High	3
21	Controlling noise levels in medical departments to ensure a quiet environment.	4.18	1.14	High	4
22	Providing green spaces inside the hospital to improve patients' psychological well-being.	4.55	0.68	Very High	1
23	Updating lighting in patient rooms to improve visual comfort and the quality of care.	4.35	0.70	Very High	2
24	Training medical teams on the importance of environmental factors in improving patient safety.	4.17	0.96	High	5
Overall Mean for Axis Four		4.30	0.41	Very High	

From Table (4), it is evident that the means for the items in Axis Four (Suggestions for Improving Environmental Factors in Hospitals) ranged from 4.17 to 4.55. The overall mean for this section is 4.30 with a standard deviation of 0.41, indicating a very high level of agreement. Four statements received a very high level of agreement, while one received a high level of agreement. The statement with the highest level of agreement was Statement (22), which states "Providing green spaces inside the hospital to improve patients' psychological well-being," with a mean of 4.55 and a standard deviation of 0.68, while the statement with the lowest level of agreement was Statement (24), which states "Training medical teams on the importance of environmental factors in improving patient safety," with a mean of 4.17 and a standard deviation of 0.96.

4. Discussion and Conclusion

The study results show that environmental factors such as air quality, noise levels, lighting, and cleanliness within hospitals directly impact patient safety. Proper ventilation and air quality in hospital departments were identified as major factors that enhance patients' health comfort and improve their breathing. Additionally, the study revealed that continuous cleanliness and effective disinfection significantly contribute to reducing the risk of infections and complications, underscoring the importance of a clean, pollutant-free environment in disease prevention.

According to the study findings, environmental factors such as noise control and optimal lighting play a significant role in enhancing patient safety. For instance, a quiet environment helps greatly in reducing stress among patients and improving their mental well-being, which positively impacts their overall health and safety. Furthermore, ideal lighting contributes to enhancing the visual performance of medical teams, leading to better treatment outcomes. In other words, a

healthy and safe environment facilitates quick and effective responses to treatment, which enhances recovery outcomes.

The study confirmed that environmental factors play a key role in improving patients' treatment experiences. Among these factors, the study found that providing a quiet and clean environment significantly contributes to improving patients' mental comfort and enhances their positive treatment experiences. The study also showed that the presence of green spaces within the hospital contributes to creating a psychologically comfortable healing environment, promoting recovery. Moreover, the design and organization of the hospital facilitate easier access to medical services and increase patient comfort, making their treatment experience more positive.

Based on the results obtained, the study suggested several ways to improve environmental factors within hospitals to enhance patient safety and improve their treatment experience. Key suggestions include improving air quality through effective ventilation, controlling noise levels to ensure a quiet environment, and providing green spaces to improve patients' mental comfort. The study also highlighted the importance of updating lighting in patient rooms to improve visual comfort and enhance the quality of care, as well as the need to train medical teams on the importance of environmental factors and their direct impact on patient safety. These suggestions represent an important step toward improving hospital environments to achieve maximum benefit for patients and enhance healthcare outcomes.

5. Study Recommendations:

In light of the findings, the researcher recommends the following:

1. Enhancing ventilation and air conditioning systems in hospitals to ensure air quality and reduce pollutants that may affect patients' health.

2. Increasing the use of soundproof materials in patient rooms and critical areas to reduce noise levels and improve patient comfort.

3. Ensuring adequate and appropriate lighting in all hospital departments to enhance visual comfort and reduce eye strain for patients.

4. Implementing strict hygiene policies and regularly disinfect surfaces and medical equipment to minimize the risk of infections.

5. Improving water quality monitoring within hospitals to ensure it is free from contaminants that could affect patient health.

6. Enhancing hospital design to improve the flow of patients and visitors and provide green spaces within the facility to promote patients' psychological comfort.

7. Providing continuous training for hospital staff on the importance of environmental factors and their direct impact on patient safety.

8. Applying artificial intelligence technologies to continuously monitor environmental factors and analyze data to ensure patient safety and create a safe treatment environment.

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