DESIGN OF MENTAL HEALTH FACILITY

Perception of Indoor Environmental Quality (IEQ) in Mental Health Facilities towards the Design of a Proposed Psychiatric Hospital in Ibadan

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Abstract

The condition of the indoor environment within psychiatric facilities plays a crucial role in the psychological and physical recovery of mental health patients. Although this is widely acknowledged globally, many mental health institutions in Nigeria and throughout sub-Saharan Africa tend to neglect the effects of Indoor Environmental Quality (IEQ) on patients' well-being. This research examines the perceptions and implications of IEQ in mental health settings, aiming to guide the design of a new psychiatric hospital in Ibadan, Nigeria. It focuses on essential IEQ factors—thermal comfort, indoor air quality, lighting, and acoustics—and how they impact user experience and health outcomes. The research adopts quantitative research strategy in the form of questionnaire for data collection while the data were analysed using mean ratings and standard deviations, which provided insights into perceptions of the various IEQ factors. The study finds out that there is significant disparity between the current environmental conditions of psychiatric hospitals in Nigeria and recognized global standards. Participants stressed the importance of adaptive design techniques, access to natural light, sound management, sufficient airflow, and thermal comfort in fostering healing environments and sustainability. The research concludes that incorporating evidence-based indoor environmental quality (IEQ) factors into the architectural design of mental health facilities can greatly enhance patient recovery rates, improve staff productivity, and elevate overall healthcare service delivery. It advocates for patient-focused and sustainable architectural solutions that improve environmental quality while aligning with clinical objectives. This study recommends that policy-driven design reforms that emphasize IEQ in mental health infrastructure should be instituted.

Keywords: Indoor Environmental Quality (IEQ); mental health facilities; psychiatric hospital design; sustainable design

1 Introduction

Healthy, high-performance buildings should have positive outcomes in terms of energy, sustainability, health, and productivity. A healthy building should meet the World Health Organization (WHO) definition of health, "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". (World Health Organization [WHO], 1948). The use of this definition of health is particularly applicable to green buildings, intent on not only reducing exposures to chemicals, but also promoting exercise, lowering stress, increasing social interactions, and otherwise fostering physical, social, and mental health for the occupants. Effective evidence-based design (EBD) not only meets the WHO health definition, but also encompasses productivity, operational efficiency, economic performance, and occupant/customer satisfaction as well as sustainability. Thus, EBD

needs to be combined with sustainable design, incorporating all practices that reduce the negative impact of development on ecological health and indoor environmental quality (Lawson, 2010).

Indoor Environmental Quality (IEQ) significantly affects healthcare facilities, impacting patient well-being, staff productivity, and healthcare outcomes. Many studies have provided linkages between the environment and people's health and wellbeing, including evidence-based and patient-centered design of hospital buildings (Mourshed and Zhao, 2012). The most difficult component of hospital design is creating an environment that promotes healing rather than hindering it. Much has not been done in terms of determining the influence of "environmental stresses" on healthcare facility inhabitants. This is because other areas of green building design, such as the impact of the environment on building occupants' health and comfort, have garnered more attention as a concern for sustainable development (Smith and Pitt, 2011). Stress has been linked to a poor interior environment in hospitals (Zborowsky and Kreitzer, 2008), which has an impact on patient recovery as well as staff productivity (Andrade et al., 2012). As a result, a lousy indoor environment has a negative impact on a building's occupants' physical and mental health (Mahbob et al., 2011; Sadek and Nofal, 2013). However, research from Andrade et al. (2012), Chaudhury et al. (2009) and Dijkstra et al. (2006) suggested that effective hospital environment design can improve patient care and treatment outcomes while minimizing medical errors and waste. The nature of the indoor environment in hospital buildings has been found to affect patient healing processes (Chaudhury et al., 2009; Choi et al., 2012; Dijkstra et al., 2006; Ghazali and Abbas, 2012; Huisman et al., 2012), as well as staff well-being and task performance (Chaudhury et al., 2009; Choi et al., 2012; Al-Ahmadi, 2009; Andrade et al., 2012; Janakiraman et al., 2011).

In a hospital setting, it has also been discovered that the temperature and air quality of the facility have a major impact on the residents (Hwang et al., 2007). Infections with a high-risk factor could be contracted as a result of the presence of indoor air pollutants in a hospital environment. As a result, Salonen et al. (2013) said that the resulting risk factor owing to the presence of an air contaminant could result in the death of a patient whose body immunity has been much decreased. Ramaswamy et al. (2010) did a study that revealed the impact of air pollutants in hospital facilities where patients were infected with diseases other than those for which they were being treated. As a result, ensuring that the indoor air quality (IAQ) is free of contaminants and dangerous substances requires controlling the flow of air inside the hospital environment and providing efficient ventilation (Ramaswamy et al., 2010). There will not be enough air to dilute the contaminants created in a space where the ventilation rate is low. It was also revealed that air pollutants in a building's internal environment had an impact on the residents reasoning, work efficiency and behavior (Clements-Croome, 2008; Tang and Wan, 2011). Different ways are being attempted by both designers and healthcare managers in order to ameliorate the evident effects of IEQ for improved performance in order to provide an atmosphere that is appealing to building occupants.

However, the most challenging part of designing mental health facilities is creating an environment that promotes recovery rather than one that hinders it. Much has not been done in the aspect of ascertaining the level of impact of indoor environmental quality (IEQ) on the recovery of mental health patients in healthcare facilities. Determining the extent to which "indoor environmental quality (IEQ)" affects building occupants in healthcare facilities is an area that has not received much attention especially in developing country such as Nigeria. It is widely accepted that elements of IEQ, such as daylighting, thermal comfort, acoustics, and indoor air quality can significantly influence people's health. According to channon (2023), these elements can either diminish feelings of well-being or convey positive and negative information, impacting individuals' self-esteem, sense of

security, and identity. Parson (2013) also stated that human beings are surrounded by an environment at all times; thus, maintaining their well-being and comfort is a major task. As a result, providing an indoor environment that improves occupant health and well-being, contentment and performance should be prioritized in building design and environmental sustainability especially for a mental health building (Fisk, 2000).

As at today most of our mental health facilities are devoid of all these basic elements of IEQ, therefore, this study is tailored to improve and enhance the IEQ of mental health facilities in the design of a psychiatric hospital in Ibadan. To achieve this aim, the study specific objectives are to (i) examine the socio-economic characteristics of the staffs in selected psychiatric hospitals and (ii) evaluate the perception of staff and some recovering out-patient about indoor environmental quality (IEQ) of selected psychiatric hospital.

2 Materials and methods

2.1 Study area

The study areas are two facilities in Nigeria. There are Neuropsychiatric Hospital Yaba in Lagos state, and Neuropsychiatric Hospital Aro in Ogun state.

2.2 Research design

The research design refers to the strategy and plan within which research is conducted. It constitutes the strategy for the collection, measurement and analysis of data in order to address the research questions or problems (Kothari, 2019). Therefore, for this study, the researcher used a quantitative research design where data were collected, measured, and analyzed quantitatively. The quantitative method adopted was in the form of questionnaire which will comprehensively evaluate the perception of indoor environmental quality in mental health.

2.3 Population and sampling procedure

This study focused on staff and recovering patient of two local hospitals in Nigeria. The two selected facilities are Neuropsychiatric Hospital Yaba, and Neuropsychiatric Hospital Aro Abeokuta. The target population for the study was all staffs and recovering patients of the two facilities. For the sampling method, Kumar (2019) posited that sampling is a process of deriving a representative group from the target population. This representational group must have the distinctive characteristics of the target population (Story and Tait, 2019). To create a sample, several sampling methods can be employed such as simple random sampling, purposive sampling, cluster sampling, convenience sampling and so on (Adekeye and Apeh, 2019). For this study purposive sampling method was used. Purposive sampling is a type of non-probability sampling technique in which a researcher selects the representative sample based on their relevance and criteria for inclusion (Adekeye and Apeh, 2019). The criteria for selection is based on the implementation of local building materials, knowledge of the facilities as well as the geographical location.

2.4 Sample size

The sample size for the study was determined based on the Cochran formula. Cochran formula is used to calculate the essential sample size for the required level of precision, confidence level and the

estimated proportion of the attribute present in the population. Therefore, the Cochran formula for infinite number is used. This is expressed as

$$n = \frac{Z^2 \cdot p \cdot (1 - p)}{e^2} \quad (1)$$

where n = required sample size; Z = Z-score (1.65 for a 90% confidence level); p = estimated population proportion (0.5 for maximum variability); and e = margin of error (Cochran, 1977).

Using this expression, the calculated respondents for a facility is total at 81 while for two facilities will be 192. However, the sample size was approximated to 200 respondents for the two local facilities.

2.5 Methods of collecting data

For this study, questionnaires were used to collect data. The questionnaire was designed to cover two (2) sections i.e. section A and B. The two sections of the questionnaire consist of questions from the various items that assess the IEQ for the study. Section A looks at the socioeconomic and Cultural characteristics of the respondents. The socioeconomic and Cultural characteristics section included questions about the participant's gender, age, institution, level of education, and ethnical background. Sections B was divided into six subsections which look at Staff /Recovery Patient Perception of Indoor Environmental Quality on Sound, lightening, temperature, spatial clarity, greenery and calm spaces. This section of the questionnaire sought to gather information on the various measures to enhance indoor environmental quality in the design of a psychiatric hospital. In addition, for section B, the five-point Likert scale method was used as a rating method to guide the participants and assess their level of agreement on the question asked. It provides a simple and understandable way for respondents to measure their perception (Tanujaya et al., 2022). Also, Closed-ended questions were used to reduce subjectivity in respondent's responses

2.6 Questionnaire administration

The questionnaire was administered to the users of the two mental health facilities using manual method. This involves handing hardcopy of printed questionnaires to respondents. The questionnaire was developed and reviewed to address the research questions. Before handling the questionnaire to the respondents, clear instructions and the purpose of the questionnaire were communicated to ensure clarity and informed consent.

2.7 Method of data analysis

To analyse the data collected, mean, and standard deviation was used. Mean and standard deviation were used to answer the research question to determine the acceptance level of the items, a mean score of 3.00 was used in line with the five (5) point rating scale adopted for the study. Any item with a mean score of 3.00 and above will be considered as agreed while mean score below 2.99 will be considered as disagreed.

A five-point rating scale was used: strongly agreed (SA) = 5 points; agreed (A) = 4 points; neutral (N) = 3 points; disagreed (D) = 2 points; strongly disagreed (SD) = 1 point.

The mean of the respondents was computed with the formula

$$\overline{X} = \frac{\sum FX}{N} \quad (2)$$

where F = frequency of each response, X = point value of the response, N = number of respondents to the item and $\sum$ = summation.

Therefore, the mean of the five-point scale is

$$\overline{X} = \frac{5+4+3+2+1}{5} = \frac{15}{5} = 3.00 \quad (3)$$

3 Results and interpretation

This section presents the results of the study and its analysis. The demographic characteristics of the respondents are described using descriptive statistics. To further evaluate the perception of indoor environmental quality in mental health facilities, data collected through the questionnaire survey was analysed using appropriate statistical techniques.

Before performing the analysis, the dataset underwent input, coding, and thorough cleaning to ensure accuracy and reliability. The analysis was conducted using SPSS version 29, a powerful statistical tool known for its ability to manage large datasets with extensive variables. SPSS facilitates large-scale research through its ability to manage complex data structures and its advanced visualization capabilities, which help present findings in a clear and interpretable format (Pallant, 2020).

3.1 Socio-economic and cultural characteristics of respondents

Understanding the socio-economic and cultural characteristics of respondents is crucial in evaluating their perspectives on Indoor Environmental Quality (IEQ) in mental health facilities. These attributes provide a comprehensive view of the diverse stakeholders involved in the design, administration, and use of psychiatric hospitals. This section examines demographic factors, including gender, age range, ethnicity, marital status, educational level, and stakeholder group. By analyzing these characteristics, the study establishes a foundation for identifying patterns in perceptions of IEQ, shaping how different groups experience thermal comfort, acoustics, lighting, air quality, and overall hospital layout.

The characteristics of the respondents are presented in Table 1.

Table 1. Socio-economic and cultural characteristics of respondents.

Variables	Neuropsychiatric Hospital Yaba, Lagos State	Neuropsychiatric Hospital Aro, Abeokuta	Others	Frequency	Percentage (%)
Gender					
Female	54	57	1	112	56
Male	45	42	1	88	44
Total	99	99	2	200	100
Age					
18-24	6	5		11	5.5
25-34	28	33	2	63	31.5
35-44	50	53		103	51.5
45-54	15	8		23	11.5

Variables	Neuropsychiatric Hospital Yaba, Lagos State	Neuropsychiatric Hospital Aro, Abeokuta	Oth-ers	Fre-quency	Percentage (%)
Total	99	99	2	200	100
Stakeholders					
Facility staff	29	28		57	28.5
Non facility staff	30	31	2	63	31.5
Patient	6	10		16	8
Staff	31	30		61	30.5
Visitor	3			3	1.5
Total	99	99	2	200	100
Level of education					
BSc	77	66	1	144	72
Diploma		1		1	0.5
MSc	15	22	1	38	19
SSCE	7	10		17	8.5
Total	99	99	2	200	100
Marital Status					
Married	52	51		103	51.5
Single	47	48	2	97	48.5
Total	99	99	2	200	100
Ethnicity					
Hausa	11	4		15	7.5
Igbo	24	28		52	26
Urhobo	1			1	0.5
Yoruba	63	67	2	132	66
Total	99	99	2	200	100

The socio-economic and cultural profile of respondents plays a vital role in understanding how indoor environmental quality (IEQ) supports therapeutic outcomes in psychiatric hospitals. The analysis draws from two facilities—Neuropsychiatric Hospital Yaba, and Neuropsychiatric Hospital Aro offering insights into how users experience and evaluate environmental comfort.

The gender distribution reveals a 56% female and 44% male respondent base, reflecting a reasonably balanced representation. This split is significant given that both male and female stakeholders including staff and patients—may experience different environmental stressors or comfort preferences. Age-wise, the data set is skewed toward mature adults, with 51.5% aged 35-44, and an additional 31.5% in the 24–34 category. This suggests that the majority of respondents are either active staff or middle-aged patients, groups more likely to interact intensively with hospital interiors. Their input is vital for tailoring IEQ variables—such as lighting levels, acoustic comfort, and spatial navigation to long-term users of the space. Only 5.5% of respondents are under 25, indicating that

younger users are less represented, but still relevant for understanding first-time or temporary user experiences.

Respondents represent diverse professional roles, including facility staff (28.5%), non-facility staff (31.5%), support staff (30.5%), and patients (8%), with visitors contributing 1.5%. Notably, the inclusion of patients' voices, even at 8%, ensures that the study captures perspectives directly tied to healing and comfort, rather than operational concerns alone. Academic qualifications show that 72% of respondents hold a BSc, and an additional 19% possess an MSc, marking this as a highly educated group. This level of education translates to greater awareness and articulation of built environment challenges—meaning respondents are likely able to recognize, evaluate, and critique subtle influences on spatial health. The presence of SSCE holders (8.5%) and Diploma holders (0.5%) ensures that feedback isn't exclusively technical, but includes more intuitive, experience-based perspectives.

Marital status is relatively balanced, with 51.5% married and 48.5% single. Ethnicity offers a final lens of relevance. Yoruba respondents account for 66% of the sample—understandable given the study's southwestern Nigerian focus—followed by Igbo (26%), Hausa (7.5%), and Urhobo (0.5%). Overall, these demographic findings provide a strong, multidimensional context for evaluating and improving IEQ. They ensure that recommendations for lighting, thermal control, ventilation, and noise management are grounded in user realities—not just technical standards.

3.2 Staff/recovering patient perception of indoor environmental quality (IEQ)

This section focuses on assessing how users—specifically hospital staff and recovering patients—perceive key elements of indoor environmental quality (IEQ) within mental health facilities. The domains under review include sound, lighting, temperature, spatial clarity, greenery, and calmness. These dimensions were evaluated through structured Likert-scale responses, where higher mean scores indicate more favorable perceptions. Each IEQ parameter was assessed using a 5-point scale, and the responses were statistically analyzed using mean and standard deviation. The goal was to capture nuanced insight into user comfort, environmental satisfaction, and perceived therapeutic support.

3.2.1 Sound

The analysis of sound perception reveals a recurring challenge in maintaining a therapeutic acoustic environment. A significant majority of respondents 75.5% rated internal noise from people and activities within the hospital as "normal," while 22.5% described it as outright "noisy." Only 1.5% experienced quiet conditions, resulting in a mean score of 2.78 (SD = 0.46), which falls below the acceptance threshold of 3.00. Similarly, responses regarding the intrusion of external noise such as traffic and construction followed a comparable trend, with 72% reporting "normal" sound levels, and just 2.5% experiencing it as quiet or better. This item recorded a slightly lower mean of 2.75 (SD = 0.53), confirming that noise pollution from outside remains a noteworthy disruptor of environmental tranquility.

Noise from hospital equipment, although less obtrusive, was still a concern. A notable 79% rated this as "normal," with minimal respondents experiencing it as quiet (2.5%) or disruptive (18.5%), leading to a mean score of 2.85 (SD = 0.51). Similarly, when asked about the impact of noise on their ability to rest or focus, 78.5% reported a neutral experience, while 17.5% noted that it actively hindered concentration or sleep. Only 3% found the space genuinely quiet, leading to another mean score of 2.85 (SD = 0.50).

The most favorable result was seen in the effectiveness of walls and doors to block unwanted sound, with 81% rating the condition as "normal" and 7% experiencing it as quiet or extremely quiet. Despite this, only 5% found the insulation insufficient, and the mean score of 2.88 (SD = 0.49) suggests moderate satisfaction but still below the desired standard for acoustic control in a psychiatric care setting.

The findings emphasize the importance of incorporating acoustic control strategies such as zoned spatial layouts, sound-absorbing materials, and external noise buffers into the design of mental health facilities. Such interventions are essential not just for meeting global best practices but for creating truly restorative spaces where patients can recover in calm, psychologically safe surroundings.

The responses on sound are presented in Table 2.

Table 2. Staff/recovering patient perception of indoor environmental quality: sound (source: author's analysis).

S/N	Item	Very Noisy		Noisy		Normal		Quiet		Extremely Quiet		Mean	SD
		F	%	*F*	%	*F*	%	*F*	%	*F*	%		
1	How often do you notice disturbing noise from people or activities within the hospital?	1	0.5	45	22.5	151	75.5	3	1.5	0	0.0	2.78	0.46
2	How much do outdoor noises (like traffic or nearby construction) affect your peace indoors?	4	2.0	47	23.5	144	72.0	5	2.5	0	0.0	2.75	0.53
3	How would you describe the noise level from hospital equipment or machines?	2	1.0	35	17.5	158	79.0	2	1.0	3	1.5	2.85	0.51
4	How much does noise affect your ability to rest or focus in this environment?	2	1.0	35	17.5	157	78.5	4	2.0	2	1.0	2.85	0.50
5	How well do the walls and doors block out unwanted sounds from nearby areas?	3	1.5	27	13.5	162	81.0	7	3.5	1	0.5	2.88	0.49

3.2.2 Lighting

The perception of lighting conditions within the selected psychiatric hospitals shows mostly neutral satisfaction with areas that fall just short of the ideal therapeutic standard. Natural lighting received a moderate rating, with 63.0% of respondents classifying it as "normal" and 33.0% as "bright." However, the mean score for this item was 2.65 (SD = 0.55), the lowest among the five lighting indicators, suggesting limited daylight penetration despite the clinical importance of sunlight exposure in mood regulation and recovery.

Visibility for daily activities such as reading or writing without turning on electric lights scored slightly better, with 77.5% of respondents reporting "normal" conditions and 19.0% affirming brightness. This resulted in a mean of 2.84 (SD = 0.49), indicating general adequacy during daytime hours, but still reflecting potential overreliance on artificial sources in wards and offices. Electric light brightness at night showed fairly stable satisfaction, with 77.0% of participants identifying light

levels as "normal" and a modest 15.5% describing them as "bright." The mean here rose to 2.90 (SD = 0.53), suggesting functional but unremarkable lighting design. A similar trend appears in responses on eye comfort, where 80.0% described lighting as "normal," though a small percentage (6.5%) expressed discomfort with overly dark spaces, yielding a mean score of 2.95 (SD = 0.51).

The most favorable assessment emerged from the general rating of lighting conditions, where 72.0% found them "normal," 15.5% "bright," and only 12.5% felt the space was dim. Yet, this item still only achieved a mean score of 2.98 (SD = 0.54), narrowly missing the satisfaction threshold of 3.00. These results suggest that lighting across the surveyed facilities is functionally adequate but lacks the vibrancy, variability, or user control needed for a truly healing environment.

The responses on lighting are presented in Table 3.

Table 3. Staff/recovering patient perception of indoor environmental quality: lighting (source: author's analysis).

S/N	Item	Very Bright		Bright		Normal		Dark		Very Dark		Mean	SD
		F	%	*F*	%	*F*	%	*F*	%	*F*	%		
1	How would you rate the amount of natural light (sunlight) that enters your ward or office during the day?	4	2.0	66	33.0	126	63.0	4	2.0	0	0.0	2.65	0.55
2	How well can you see to read, write, or carry out your duties during the day without turning on electric lights?	1	0.5	38	19.0	155	77.5	4	2.0	2	1.0	2.84	0.49
3	How would you rate the brightness of electric lights in your space at night?	2	1.0	31	15.5	154	77.0	11	5.5	2	1.0	2.9	0.53
4	How comfortable are your eyes with the current lighting in your ward or office?	2	1.0	23	11.5	160	80.0	13	6.5	2	1.0	2.95	0.51
5	How would you rate the overall lighting conditions in your ward or workspace?	0	0.0	31	15.5	144	72.0	24	12.0	1	0.5	2.98	0.54

3.2.3 Temperature

The perception of thermal comfort among users in psychiatric hospitals reveals mixed experiences across time of day and weather conditions. During daytime hours, a combined 97% of respondents rated temperatures as either "normal" (56.0%) or "warm" (40.5%), yet only 1.0% described it as "cold," suggesting relatively stable but mildly warm interiors. Despite this, the mean score of 2.56 (SD = 0.56) indicates a slight drift toward discomfort in warmer conditions, especially when considered alongside responses about afternoon hours (Mean = 2.70), where 28.5% still found the temperature warm and only 1.5% cold or very cold.

When asked about nighttime comfort, 74.5% found the temperature "normal," with a small but notable 3.5% expressing that it felt cold or very cold, resulting in a mean score of 2.81 (SD = 0.53). This suggests greater satisfaction after sunset but still does not reach the therapeutic target threshold of 3.00. Perceptions of thermal performance during external weather changes mirrored these patterns. When conditions outside were hot, 74.5% still felt indoor temperatures were "normal,"

though 24.5% found them "warm" or worse. Conversely, when the weather outside was cold or rainy, 78.0% described indoor conditions as "normal" and 11.5% as "cold," producing the only above-threshold mean score: 3.01 (SD = 0.49).

Overall, thermal conditions in psychiatric facilities are experienced as functional but not fully comfortable. Respondents generally rated temperatures as tolerable, but the persistent cluster of mean scores below 3.00 underscores the absence of personalized or adaptable thermal regulation. These findings support the integration of passive cooling strategies, responsive ventilation systems, and zone-specific climate control in future facility design, especially considering the sensitivity of mental health patients to thermal variations.

The responses on temperature are presented in Table 4.

Table 4. Staff/recovering patient perception of indoor environmental quality: temperature (source: author's analysis).

S/N	Item	Very Warm		Warm		Normal		Cold		Very Cold		Mean	SD
		F	%	*F*	%	*F*	%	*F*	%	*F*	%		
1	How would you describe the indoor temperature in your ward or office during the day-time?	5	2.5	81	40.5	112	56.0	2	1.0	0	0.0	2.56	0.56
2	How does the temperature in-side affect your comfort during the afternoon hours?	4	2.0	57	28.5	136	68.0	2	1.0	1	0.5	2.70	0.55
3	At night, how would you rate the temperature in your room for resting or sleeping?	3	1.5	41	20.5	149	74.5	6	3.0	1	0.5	2.81	0.53
4	How does the temperature usually feel when the weather outside is hot?	3	1.5	46	23.0	149	74.5	2	1.0	0	0.0	2.75	0.49
5	How does the temperature usually feel when the weather outside is cold or rainy?	0	0.0	21	10.5	156	78.0	23	11.5	0	0.0	3.01	0.49

3.2.4 Spatial clarity

Spatial clarity reveals a general perception of satisfactory, though not exceptional, navigation and layout within the psychiatric hospital environments. Across all five items, mean scores range between 2.79 and 2.98, all falling just below the acceptance threshold of 3.00. This points to moderately favorable conditions that lack strong affirmation from users.

Most notably, 74.0% of respondents reported that navigating the hospital was "neutral," while 20.5% experienced some confusion, producing the lowest mean score in this domain at 2.79 (SD = 0.53). Signage received a slightly better assessment, with 76.0% rating direction indicators as "neutral" and only 0.5% finding them "very clear," resulting in a mean score of 2.86 (SD = 0.49).

The clearest spatial success was related to crowd management and layout flow, where 80.0% rated the arrangement as "neutral," 7.0% as "clear," and 1.5% as "very clear," giving it a near-threshold mean of 2.98 (SD = 0.51). Similarly, users' ability to find their way unaided—an important component

of accessibility—recorded a mean of 2.91, with 79.0% identifying the experience as neither confusing nor intuitive.

Finally, the overall layout and organization of the facility received a mean score of 2.88 (SD = 0.50), supported by 75.0% neutral ratings. While few respondents found the layout actively confusing (only 18.5% across all items), the limited expression of clarity suggests that spatial design is functional but lacks deliberate legibility.

The findings point to a physical environment that is adequately navigable but not actively intuitive. Improvements in visual cues, zonal identity, and architectural finding strategies—such as color-coded zones, clear spatial hierarchies, and visible entry sequences—could enhance user autonomy and orientation, particularly important in mental health where clarity and predictability foster comfort and control.

The responses on spatial clarity are presented in Table 5.

Table 5. Staff/recovering patient perception of indoor environmental quality: spatial clarity (source: author's analysis).

S/N	Item	Very Confusing		Confusing		Neutral		Clear		Very Clear		Mean	SD
		F	%	*F*	%	*F*	%	*F*	%	*F*	%		
1	How often do you find your way around different parts of the hospital?	4	2.0	41	20.5	148	74.0	7	3.5	0	0.0	2.79	0.53
2	How clear are the signs and directions posted around the hospital?	0	0.0	38	19.0	152	76.0	9	4.5	1	0.5	2.86	0.49
3	How well is the hospital space arranged to avoid over-crowding and confusion?	1	0.5	22	11.0	160	80.0	14	7.0	3	1.5	2.98	0.51
4	How easy is it for new visitors or patients to know where to go without help?	1	0.5	30	15.0	158	79.0	9	4.5	2	1.0	2.91	0.50
5	How would you describe the general layout and organization of the hospital building?	1	0.5	36	18.0	150	75.0	13	6.5	0	0.0	2.88	0.50

3.2.5 Greenery

The perception of greenery in the psychiatric hospital environment, as reported by staff and recovering patients, suggests a landscape that is visible but functionally underutilized. Across all five items, mean scores ranged from 2.81 to 2.91, consistently remaining below the 3.00 benchmark that signifies a satisfactory experience. The most frequently observed condition was “sometimes available,” reflecting the presence of green elements without consistent access or integration into the therapeutic routine.

A notable 76.0% of respondents observed greenery such as trees, plants, or gardens “sometimes available,” with only 4.5% reporting they “often” saw such elements. This yielded a mean score of 2.83 (SD = 0.52), indicating low visual prominence of landscape features. Similarly, 71.5% reported “sometimes” having access to green space for relaxation, but only 4.5% rated their access as “often” or “always,” resulting in the lowest domain mean of 2.81 (SD = 0.57).

When asked how greenery influences the atmosphere, 75.5% acknowledged that plants and gardens "sometimes" contribute to a peaceful environment, but only 5.5% felt this effect consistently. This sentiment generated a modest mean score of 2.85 (SD = 0.56), implying that the environmental benefits of greenery are recognized yet not fully harnessed. Shaded outdoor seating—a valuable asset for reflection or informal therapy—was reportedly "sometimes available" for 80.5% of respondents, producing the highest mean of the group at 2.91 (SD = 0.53), though this still fell short of positive affirmation.

Finally, interaction with green areas around the hospital remains rare. Although 76.0% "sometimes" engage with these spaces, only 6.0% do so often or always, leading to a mean perception score of 2.88 (SD = 0.56). This suggests that greenery, while present in form, lacks programmatic integration or spatial invitation, limiting its potential to foster recovery.

The findings reflect a green environment that is passively accepted but not actively utilized. For psychiatric hospitals to align with biophilic design principles, landscape elements must be more visible, accessible, and emotionally resonant. Introducing enclosed gardens, sensory pathways, horticultural therapy zones, and shaded seating can transform greenery from passive decor into an essential dimension of therapeutic care

The responses on greenery are presented in Table 6.

Table 6. Staff/recovering patient perception of indoor environmental quality: greenery (source: author's analysis).

S/N	Item	Not Available		Rarely Available		Sometimes Available		Often Available		Always Available		Mean	SD
		F	%	*F*	%	*F*	%	*F*	%	*F*	%		
1	How often do you see trees, plants, or gardens around the hospital premises?	4	2.0	35	17.5	152	76.0	9	4.5	0	0.0	2.83	0.52
2	How often do you have access to a green space or garden for relaxation or walks?	2	1.0	46	23.0	143	71.5	6	3.0	3	1.5	2.81	0.57
3	How much does the presence of plants or greenery make the environment feel more peaceful?	3	1.5	35	17.5	151	75.5	9	4.5	2	1.0	2.85	0.56
4	How available are shaded outdoor spaces with greenery where you can sit or relax?	3	1.5	26	13.0	161	80.5	7	3.5	3	1.5	2.91	0.53
5	How often do you interact with or spend time in green areas around the hospital?	3	1.5	33	16.5	152	76.0	9	4.5	3	1.5	2.88	0.56

3.2.6 Calm spaces

Responses from staff and recovering patients reveal that while calm spaces exist within the psychiatric hospital setting, their effect is perceived as moderate rather than consistently restorative.

Overall, mean scores in this domain range from 2.76 to 2.96, with none meeting the 3.00 threshold of clear user satisfaction. This suggests a broadly tolerable, yet under-optimized, approach to calm space provision.

The sense of personal tranquility within wards or common areas scored the lowest, at a mean of 2.76 (SD = 0.57), with 72.5% describing their experience as only "moderately calm." Just 3.0% found the setting not calm at all, while a mere 0.5% described it as "very calm." Access to a quiet space for uninterrupted relaxation fared slightly better, recording the highest mean of 2.96 (SD = 0.55). Yet even here, only 9.5% found these spaces genuinely calm or peaceful, with nearly 80% situating their experience within a neutral middle ground. Similarly, greenery's perceived calming influence was rated modestly. Although 77.5% acknowledged that plants and vegetation created some peacefulness, only 7.5% found that effect meaningful enough to classify as "calm" or "very calm," resulting in a mean score of 2.92 (SD = 0.51). Availability of shaded outdoor spaces followed this pattern (Mean = 2.88), as did time spent in green areas (Mean = 2.92), both of which suggest intermittent engagement and limited emotional impact.

These findings highlight a recurring theme: calm is felt sporadically rather than intentionally cultivated. To enrich therapeutic outcomes, psychiatric facilities must go beyond providing green elements or quiet areas as static features. Instead, they should embed calming zones into everyday routines, supported by design strategies like acoustic shielding, biophilic cues, low-stimulation spaces, and well-defined personal zones.

The responses on calm spaces are presented in Table 7.

Table 7. Staff/recovering patient perception of indoor environmental quality: calm spaces (source: author's analysis).

S/N	Item	Not Calm at All		Slightly Calm		Moderately Calm		Calm		Very Calm		Mean	SD
		F	%	*F*	%	*F*	%	*F*	%	*F*	%		
1	How calm or peaceful do you feel when sitting in your ward, office, or common areas?	6	3.0	43	21.5	145	72.5	5	2.5	1	0.5	2.76	0.57
2	How often do you have a quiet space where you can relax without interruptions?	4	2.0	20	10.0	157	78.5	17	8.5	2	1.0	2.96	0.55
3	How much does the presence of plants or greenery make the environment feel more peaceful?	2	1.0	28	14.0	155	77.5	14	7.0	1	0.5	2.92	0.51
4	How available are shaded outdoor spaces with greenery where you can sit or relax?	1	0.5	37	18.5	148	74.0	12	6.0	2	1.0	2.88	0.54
5	How often do you interact with or spend time in green areas around the hospital?	3	1.5	26	13.0	156	78.0	14	7.0	1	0.5	2.92	0.52

4 Discussion of results

The findings from this study provide a nuanced understanding of user perceptions on indoor environmental quality of mental health facilities. Each objective addressed a specific dimension of the research problem, and collectively, they offer meaningful insights that reflect both the current status and possible recommendations of indoor environmental quality in mental health facilities. Thus, from the findings of this study, it is important to improve the Indoor Environmental Quality (IEQ) in mental health facilities to facilitate patient recovery, enhance staff productivity, improve sustainability and elevate overall healthcare outcomes.

The results of this study enhance the need for design of mental health facilities to extend beyond functional needs to create therapeutic environments that nurture the physical, emotional, and psychological well-being of both patients and staff. A top priority is improving ventilation and indoor air quality and can be accomplished by integrating natural and mechanical ventilation systems that ensure a constant flow of fresh air. Given the heightened sensitivity of mental health patients, indoor air quality must adhere to global healthcare standards to prevent infections and promote respiratory comfort. Thermal comfort must also be carefully considered, with buildings designed to adapt to local climatic conditions. Employing passive cooling strategies such as optimal building orientation, shading devices, insulated envelopes, and high thermal mass materials is essential. Allowing occupants to have individual control options, like ceiling fans or adjustable openings, promotes adaptive thermal comfort, which enhances satisfaction and recovery.

The study indicates that noise—especially from mechanical equipment and staff activities—can adversely affect patient rest and recovery. To mitigate disruptive noise, it is advisable to use sound-absorbing materials, acoustic panels, and proper spatial zoning. Design strategies should also create buffers between noisy and quiet areas, strictly enforcing guidelines for acceptable noise levels. Selection of materials should prioritize low-emission, non-toxic, and easy-to-clean options that do not compromise indoor air quality. Finishes and furnishings should foster a soothing, non-institutional atmosphere while ensuring hygiene and durability. For long-term success, policy and regulatory reforms are essential. National building codes and healthcare infrastructure policies should explicitly incorporate IEQ requirements as part of minimum design standards.

5 Conclusion and recommendations

The research indicates a marked disparity between the existing environmental standards of psychiatric hospitals in Nigeria and international best practices. Participants highlighted the importance of adaptive design approaches, access to natural light, sound control, proper ventilation, and thermal comfort in fostering healing environments. The study concludes that incorporating evidence-based Indoor Environmental Quality (IEQ) factors in the design of mental health facilities can lead to significant improvements in patient recovery rates, staff effectiveness, and overall healthcare service delivery. It advocates for patient-focused and sustainable architectural solutions that improve environmental quality while aligning with clinical objectives. This study adds to the understanding of healthcare architecture in Nigeria and calls for design reforms driven by policy that emphasize IEQ in mental health infrastructure.

It is therefore, recommended that operable windows, cross-ventilation strategies, and HVAC systems equipped with HEPA filters to manage airborne pollutants and maintain high indoor air quality. As well as instituting a multidisciplinary approach that integrates architecture, environmental

psychology, engineering, and public health for creating psychiatric hospitals that are not just functional but genuinely supportive of healing.

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