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Evidence-based design: The role of outpatient design elements on medical staff satisfaction and performance in a post-COVID-19 pandemic

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ABSTRACT

Contemporary hospitals may be recognized by a large variety of activities, not only delivery of care but also some concerns, such as the satisfaction level of users. This research investigates the relationship between outpatient department (OPD) design elements and medical staff satisfaction and performance, especially in light of the pandemic since 2020. A mixed-method approach was used to gather doctors' and nurses' perspectives at two hospitals in Sulaimani City. This involved an EBD questionnaire and a modified AEDET checklist where respondents filled out a 39-item questionnaire at the hospitals' OPD. The results highlight the importance of the interior environment's quality in promoting the satisfaction of medical staff. The results from the medical staff surveys showed that most medical staff expressed satisfaction with the indoor design elements, and three factors, infection control, interior appearance, and comfort and control, were essential to creating a satisfactory indoor environment. A negative correlation of some demographic information, such as practical experience and educational attainment, with medical staff satisfaction was revealed. The findings suggest that investigating the views of the medical staff can indicate the level of significance of various elements that increase their satisfaction and performance, contribute to the general body of knowledge, and inform design decisions.

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1. Introduction

Healthcare facilities today are complex structures that house various operations, including sophisticated medical equipment, as well as more low-key issues, such as user satisfaction [1, 2]. The physical features of a hospital can significantly impact the well-being of medical personnel, patients, and visitors. Design features and solutions that meet user expectations and needs can positively impact occupant health in healthcare facilities [3-5]. Therefore, the presence or absence of any design elements in an indoor setting can positively or negatively impact the user's psychological state, including their mood and stress levels [2, 3, 6, 7]. The satisfaction of medical staff is crucial for providing high-quality healthcare services. To ensure this, it is important to regularly evaluate the factors that affect their expectations of the hospital's indoor environment. Studies by Sadatsafavi et al. [8] and Andrade et al. [9] suggest that identifying and

implementing necessary modifications is necessary for achieving this goal. According to Ulrich et al. [10], hospitals with well-designed physical environments tend to be better workplaces and can lead to better outcomes for medical staff. Therefore, it is crucial to comprehend how healthcare staff perceive the various aspects of the hospital's indoor environment [8, 11]. A Post-Occupancy Evaluation (POE) is a method of understanding the relationship between a built environment's quality and its occupants' satisfaction. Evidence-based design (EBD) is a new area of design that uses research to inform decisions explicitly. Healthcare professionals from various disciplines have used this strategy to make informed decisions [3, 10, 12-15]. EBD has several global assessment tools approved by the National Health Center (NHC) and the Center for Health Design (CHD).

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Implementing EBD approaches in outpatient settings can yield several positive effects on medical staff satisfaction and performance [16–18]. Medical staff (doctors and nurses) face high physical stress during pandemics like COVID-19 [19, 20]. Studies indicate that healthcare providers risk Contracting contagious illnesses from patients as a result of airborne and surface contamination. COVID-19 primarily spreads through close contact with an infected person [3, 17, 21]. Contamination can occur through infected surfaces or hardware. As a result, the COVID-19 pandemic has led to changes in the healthcare industry, with an increased focus on outpatient care; designers face the challenge of improving indoor physical environments to control infection in healthcare buildings and withstand epidemics [17, 22]. Indoor environment dissatisfaction can lead to higher hospital employee turnover rates. Workplace, interior space, and physical environment quality can impact satisfaction. Stress can negatively affect work performance and job satisfaction, ultimately affecting healthcare service quality and outcomes [2, 23–25]. High-satisfaction medical staff provide better quality medical services, causing better healthcare results. Demographic criteria can also impact hospital users' satisfaction and psychological well-being with the building's physical surroundings [1, 26–29].

The hospital occupants' needs for satisfaction and comfort can vary between hospital departments. The OPD indoor environment's design features are crucial for improving satisfaction among patients and medical staff and lowering stress and anxiety. As a result, some fundamental needs (standard signage, patient accessibility, privacy and dignity, ample waiting area, effective support services, proper ventilation, and natural lighting, and a growth strategy) must be considered in the design of an outpatient department [23, 30, 31]. OPD typologies can be broadly categorized as either centralized or decentralized based on where the OPD waiting area is located, which provides the best outcome, the least walking distance, and the associated handling costs between units. The lobby, sectorial (grouped), linear, and mixed with the decentralized location of the waiting area are the four types of designs and locations that define the decentralized typology. The waiting area in the centralized OPD typology is encircled by the center's examination rooms and service areas. [17, 32]. When design solutions are ineffective, users may be exposed to stressful situations, medical errors, physical and biological toxins, and the transmission and spread of diseases like COVID-19 [3, 33].

Based on previous studies, several design elements have been identified as influential factors that contribute to medical staff satisfaction and performance. An efficient and well-designed layout and clear circulation (Layout and Circulation) can enhance communication between medical staff, improve workflow, and reduce stress. A logical flow in the outpatient setting can help staff members move seamlessly, improving efficiency and reducing errors. Clear architectural plans that enable medical staff to reach patients easily and foster continuous observation are essential for safety. Short travel distances and times, separate traffic types, and short traffic routes can limit disease transmission (preventing the spread of infection) and reduce waiting times [3, 16, 17]. Other researches have demonstrated the importance of comfortable surroundings and the capacity to regulate comfort levels (Comfort and Control), such as blocking sunlight. To support their level of pleasure, it is crucial to let patients and medical professionals control their environment [26, 33]. In addition, interior design components (Interior Appearance), like appropriate materials, the use of different colors, comfortable seating, adequate and appealing furniture, and a perception of hospitals as homelike, affect users' reactions impacting the indoor environment and influencing its overall quality, increasing medical staffs' satisfaction and performance [26, 33, 34].

Also, studies have linked medical staff satisfaction levels to (Privacy) factors. Privacy is essential for both patients and medical staff. Designing spaces with adequate sound insulation minimizes noise distractions, ensuring patient confidentiality and improving concentration for medical

professionals. Acoustically optimized spaces create a calmer environment, allowing staff to focus on providing quality care [3, 33]. Furthermore, research suggests infectious disease outbreaks can impact hospital staff satisfaction and productivity. (Infection Control) measures have become top priorities in healthcare facility design, including touchless systems, hands-free fixtures, and antimicrobial surfaces. Promoting staff compliance with infection control protocols through dedicated hand hygiene stations and easy access to personal protective equipment fosters a safer work environment and slows the spread of disease. Improved ventilation and air change rates inpatient areas are also essential updates in design requirements [3, 23, 35]. Also, providing consulting rooms with quality (Views) of the outside, natural elements, and feature plants has been found to influence medical staff's satisfaction and performances and reduce stress, leading to better outcomes [3, 17]. Finally, facilities, such as the use of adequate and pleasant furniture, comfortable seating, space for changing and securely storing belongings and clothes, convenient access to IT, and a place where they can get refreshments or meals quickly may affect improving medical staffs' satisfaction by improving the quality of the internal environment and performance [26, 33].

Studies indicate that users' satisfaction with healthcare facilities can vary based on their faith, culture, and education. However, healthcare facilities may only sometimes be able to accommodate users' diverse needs and expectations due to the set criteria and qualifications in place. An individual's experiences, objectives, social and cultural context, and ability to perceive information can all influence how they interpret a facility's design features [2, 8, 12, 36]. For instance, personal hygiene and environmental cleanliness are highly regarded in Kurdish culture, particularly for women. Additionally, various colors and natural textures contribute to the beauty of Kurdish designs [2, 26].

Further studies are required to establish guidelines for designing psychosocially supportive spaces in healthcare buildings in the Kurdistan Region of Iraq [2, 37]. Few studies have explored the factors that impact medical staff satisfaction and performance in a post-COVID-19 era [16]. The main objective of this study is to fill the research gap by achieving two aims. Firstly, to investigate the factors that enhance the performance and satisfaction of medical staff and how they perceive the design elements of OPD. Secondly, to explore the perspective of medical staff regarding the importance and effectiveness of these factors for their level of satisfaction in the post-pandemic era. The results can enhance the design of an OPD indoor environment, improving medical staff satisfaction and performance at healthcare facilities in a post-COVID-19 pandemic era.

2. Datasets and Methods

The study evaluated healthcare facility design using quantitative and qualitative approaches. It included questionnaire and checklist surveys, site visits, and observations. Hospital representatives joined the research team on building tours to answer questions about the outpatient department's physical surroundings.

2.1. Quantitative method

The quantitative technique collects numerical data for comparisons and analysis. It is accessible to all, and POE investigations are essential for building assessment research. A questionnaire survey can be included in any building functioning assessment research [16, 38].

A survey questionnaire was administered to evaluate the relationship between the satisfaction level of medical staff and the quality of the indoor environment in the OPD of a hospital. The questionnaire was designed for the doctors and nurses, and it aimed to determine the degree of agreement among the medical staff regarding several factors related to the indoor environment, including layout and circulation, infection control, comfort

and control, interior appearance, facilities, privacy, and views. The questionnaire included questions derived from three evaluation toolkits. The first toolkit used was the Community Health Centre (CHC) standardized design, the CHD_CHC evaluation tool. It assesses the performance and effectiveness of outpatient facilities in supporting the population's health. The second toolkit is a self-administered questionnaire that allows staff members to provide anonymous feedback on their perception of environmental design and work experience [39, 40]. The A Staff and Patient Environment Calibration Toolkit (ASPECT) is the third toolkit. It is predicated upon a database that the NHS in the UK has been using since 2008, which contains data from more than 600 research studies. The toolkit quantifies the impact of the physical surroundings on employee and patient satisfaction [41].

This questionnaire consists of three sections. Age, gender, educational level, and work experience of the medical staff were among the demographic details in the first section. In the second section, which is the core of the questionnaire, the medical staff is asked to score their degree of satisfaction with the indoor design elements of the OPD on a five-point Likert-type scale in the second section, ranging from "very dissatisfied" to "very satisfied." Thirty-nine questions about hospital OPD were included in this section of the survey. Four questions from the first round were on layout and circulation. The second set of seven questions focused on infection prevention, including limiting unnecessary travel for nurses and other personnel, cleaning properly, using isolation rooms, having easy access to an alcohol gel dispenser, and keeping clean and dirty goods in separate storage. The third set of five questions focused on the comfort and control of the medical professionals, including their ability to adjust the lighting temperature and close or open windows. Eight questions from the fourth set were created to elicit the medical staff's perceptions of the OPD's interior design components (safety and security, colors, artwork, plants, and furniture). The fifth set of inquiries (seven questions) measured medical staff satisfaction with the OPD facilities (convenient restrooms, storage areas, comfortable and flexible furniture, and separate rest areas). The sixth set of four questions focused on the privacy of the medical staff, including their ability to have visual privacy, private conversation, isolation from other patients and staff. The final series of four questions focused on views (the availability of suitable windows with a view of the outdoors).

Section three of the questionnaire contains the same 39 questions as section two. However, the purpose of this section is to gather staff members' opinions and experiences related to the effectiveness of factors in terms of promoting their level of satisfaction. On a five-item Likert-type response scale, the respondents are asked to score the effectiveness of a particular item using the following options: (1) not effective, (2) slightly effective, (3) neutral, (4) effective, and (5) extremely effective. A factor's effectiveness in improving medical staff satisfaction can be reflected in its score. Elements with higher efficacy ratings are more significant.

2.2. Qualitative approach

A qualitative technique was used to assess building-related features of OPD in hospitals. The quality of design elements in healthcare buildings was evaluated in this study using a checklist from The Achieving Excellence Design Evaluation Toolkit (AEDET), which was created by the NHS in the United Kingdom. A profile outlining the advantages and disadvantages of a design or already existing facilities is provided by the checklist [2]. Impact, Build Quality, and Functionality were the three main components of AEDET Evolution, and each had ten subsections for assessments. Since they were required to address the physical aspects of the indoor environment, the six remaining sections— This study [42] did not assess the aspects of Character and Innovation, Form and Materials, Urban and Social Integration, Engineering, Construction, and External Access.

The study examined four sections: Performance, Patient and Staff Environment, Space, and Use. The original AEDET Evolution had a 6-point scale, with the highest score being "Virtually complete Agreement (VcA)" and the lowest score being "Virtually no Agreement (VnA)," with a score of 1 point. Based on the previous study [16], the AEDET tool scale has been modified to three levels of agreement: "Weak Agreement (WA)" for the first and second scale when the item is missing or barely present, "Fair Agreement (FA)" for the third and fourth scale when the item exists in an average rate, and "Good Agreement (GA)" for the fifth and sixth scale when the item has a good presence. This discussion is based on the revised AEDET tool scale. The assessment was based on a walkthrough and photography conducted by the author and six experts.

2.3. Case Studies

To evaluate two general hospitals in Sulaimani City, a field survey was conducted with the participation of medical professionals, including doctors and nurses. The study focused on Shar Teaching Hospital (STH), established in 2013, and Asia International Hospital (AIH), established in 2022. These two hospitals were selected based on their large staff and patient populations, reputations, size (with more than 100 beds), availability of a variety of centralized and decentralized OPD types, and the difference in their construction timelines (STH was built before the COVID-19 crisis, while AIH was built after).

The first hospital is Shar Teaching Hospital (STH). It is a public facility in the Kurdsat District of Sulaimani City, on the Malik Mahmood Circle road. STH is a 400-bed general hospital that offers interdisciplinary medical services. It also has 12 ICUs and 23 operating rooms. Adjacent to the hospital building's main entrance is the OPD. The corridor doubles as a waiting area and a space for circulation. On either side of the waiting area are the doctor's offices and other amenities.



Figure 1. Indoor Environment of Shar Teaching Hospital (STH) OPD

The second hospital, Asia International Hospital (AIH), is a privately funded hospital on Shorsh Road in the Chia District of Sulaimani City. The hospital is newly constructed and has a capacity of 120 patient beds, ten advanced surgical rooms, and an eight-bed ICU. The hospital covers an area of 4,980 square meters and was built in 2022. The OPD is situated on the first floor and can be accessed through escalators and elevators connected to the main entrance of the hospital building. The OPD follows a sectorial decentralized layout comprising eight sectors and other service areas. Each sector has a central waiting area and two to three doctors' rooms. The hospital has been designed to provide easy access to different areas for patients and medical staff, ensuring a comfortable and hassle-free experience.



Figure 2. Indoor Environment of Asia International Hospital (AIH) OPD

2.4. Study participants

Respondents were informed that their participation was voluntary and confidential. The questionnaire was easy to complete and inspired participation, indirectly raising the response rate. The study included 107 medical staff members at two hospitals, including doctors and nurses. Finding the sampling error (e) with a 95% confidence level that the data correctly reflects the population led to a conclusion of 0.05. The required representative sample of respondents (n) to declare the study statistically valid was calculated using Sloven's formula [43]. The sample size determined by the calculation is ($n=84$).

$$n = \frac{N}{1 + Ne^2} \quad (1)$$

For this study, 107 questionnaires were distributed among medical staff at two hospitals, with 70 going to doctors and 37 to nurses. Out of these, 90 valid questionnaires containing accurate data were retrieved. Among the retrieved questionnaires, 62 were from doctors (43 from STH hospital and 19 from AIH hospital), and 28 were from nurses (18 from STH hospital and 10 from AIH hospital). These 90 valid questionnaires served as the basis for the findings of this study, which focused on medical staff at the OPD of the two hospitals listed in Table 1.

Table 1. Included hospitals based on the year built and the number of respondents.

Hospitals	Year of built	No. of Beds	Distributed Questionnaires		Respondents Medical Staff	
			Doctors	Nurses	Doctors	Nurses
Shar Teaching Hospital (STH)	2013	400	48	23	43	18
Asia International Hospital (AIH)	2022	120	22	14	19	10
Total			70	37	62	28

2.5. Statistical Analysis Approach:

The questionnaire data from two general hospitals in Sulaimani City were analyzed using t-tests and IBM SPSS to calculate MSS and percentages. A correlational analysis was conducted between the demographic data of

medical staff and their satisfaction level and the factors and satisfaction level of the medical staff at the OPD.

3. Results

This study employed qualitative and quantitative methodologies to provide evidence-based data on the impact of OPD design features on medical staff satisfaction.

3.1. Demographical information of the Respondents

Gender, age, educational level, and practical experience in the hospital OPD are among the personal characteristics of the medical staff (doctors and nurses) described in Table 2. The survey's findings indicate that 68.9% of respondents were doctors, compared to 31.1% of nurses; 51.1% of respondents were male, as opposed to 48.9% of respondents who were female; 27.7% of respondents were between the ages of 18 and 30; 41.2% were between the ages of 31 and 45; and 7.8% were beyond the age of 60. The findings showed that 8.9% of the medical staff had a BSc, while 22.2% had a diploma as their highest level of education. 13.3% of those with degrees had an MSc, while 55.6% were highly educated and had finished their study with a Ph.D. Regarding the medical staff's practical experience Gender, age, educational level, and practical experience in the hospital OPD are among the personal characteristics of the medical staff (doctors and nurses) described in Table 2. The survey's findings indicate that 68.9% of respondents were doctors, compared to 31.1% of nurses; 51.1% of respondents were male, as opposed to 48.9% of respondents who were female; 27.7% of respondents were between the ages of 18 and 30; 41.2% were between the ages of 31 and 45; and 7.8% were beyond the age of 60. The findings showed that 8.9% of the medical staff had a BSc, while 22.2% had a diploma as their highest level of education. 13.3% of those with degrees had an MSc, while 55.6% were highly educated and had finished their study with a Ph.D. Regarding the medical staff's practical experience in hospital OPDs, 55.6% had more than eleven years, 14.4% had five years or less, and 30% had between six and ten years.

3.2. Satisfaction Levels of Respondents

In general, medical staff (doctors and nurses) from the newly built hospital (AIH) were more satisfied than medical staff in (STH) in terms of the quality of the OPD indoor environment. The medical staff evaluation included seven sections, and their satisfaction levels are summarized in Figure 3 as follows:

-Layout and circulation: The questionnaire tested factors such as separation of user's area, waiting area locations, and proximity of supplies to exam rooms. Mean scores increased from (2.35) dissatisfied at STH to (3.29) neutral at AIH, indicating a potential for improvement in OPD layout by separating users' areas and the proximity of supplies and equipment to staff workstations.

-Infection control: This section minimizes staff travel, clean spaces, isolation rooms, easy access to alcohol gel, HEPA ventilation, and supply storage. The mean score for this factor improved from dissatisfied (2.43) at STH to satisfactory (4.01) at AIH, underscoring the significance of reducing staff movement and providing isolation rooms for infectious patients.

-Comfort and control: Controlling sunlight, temperature, lighting, and easy access to doors and windows create a comfortable work environment for medical staff. The mean score improved from unsatisfactory at STH (2.17) to satisfactory at AIH (3.90), showing the importance of regulating

temperature and lighting in contemporary hospitals.

-Interior appearance: At STH, medical staff were less satisfied (2.6) with the element's safety, colors, and furniture than at AIH (4.5). AIH's interior design has been improved with natural materials, wall art, and comfortable seating, resulting in higher staff satisfaction.

-Facilities: Staff amenities like safe storage, adaptable furniture, and snack areas are crucial for worker happiness. The mean score for this element was (2.75) at STH and (3.32) at AIH, indicating a significant difference between the two facilities.

-Privacy: Single-bed lodging, visual privacy, quiet conversation, seclusion, and gathering with relatives were essential elements. The study found a minor difference in satisfaction levels between AIH (3.6) and STH (2.7), indicating the need to improve privacy features in OPD by placing exam rooms in more discreet locations.

-Views: Views of nature, calming outdoor scenes, exposure to plants, and having windows were essential factors in improving medical staff satisfaction. However, the designers should have prioritized these factors, resulting in a dissatisfied score of (1.2) at STH and (1.8) at AIH.

Table 2. Demographic information of the respondents.

Source: Fieldwork (2023).

Item	Classification	STH number of respondents (n=61)		AIH number of respondents (n=29)		Total number of respondents (n=90)	
		Freq.	Freq.	Freq.	Percent	Freq.	Percent
Medical staff	Doctors	43	19	62	68.9		
	Nurses	18	10	28	31.1		
	Total			90	100		
Gender	Male	35	11	46	51.1		
	Female	26	18	44	48.9		
	Total			90	100		
Age (Years)	18 - 30	17	08	25	27.7		
	31 - 45	26	11	37	41.2		
	46 - 59	15	06	21	23.3		
	> 60	03	04	7	07.8		
	Total			90	100		
Educational attainment	Diploma's degree	13	07	20	22.2		
	Bachelor's degree	05	03	08	08.9		
	Master's degree	07	05	12	13.3		
	Doctoral Degree	36	14	50	55.6		
	Total			90	100		
Practical experience	5 years or fewer	08	05	13	14.4		
	6-10 years	18	09	27	30.0		
	11 years or more	35	15	50	55.6		
	Total			90	100		

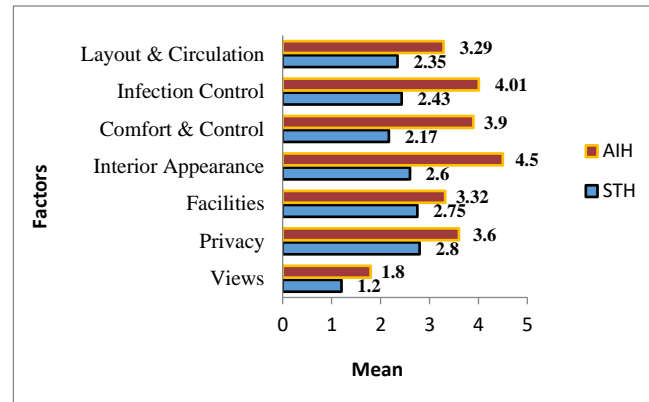


Figure 3. Medical staff satisfaction means the factors for the hospitals. (STH: Shar Teaching Hospital; AIH: Asia International Hospital)

The medical staff satisfaction assessment revealed that a majority of the medical staff were satisfied with the quality of the indoor design elements with 54% at AIH and 45% at STH, followed by neutral with 23% at STH, 15% at AIH, and dissatisfied with 17% at STH with 12% at AIH and very dissatisfied with 6% at AIH, 9% at STH. Although the two hospitals were recently built, the medical staff were very dissatisfied with the quality of the indoor environment, with 6% at STH and 3% at AIH, as shown in Figure 4.

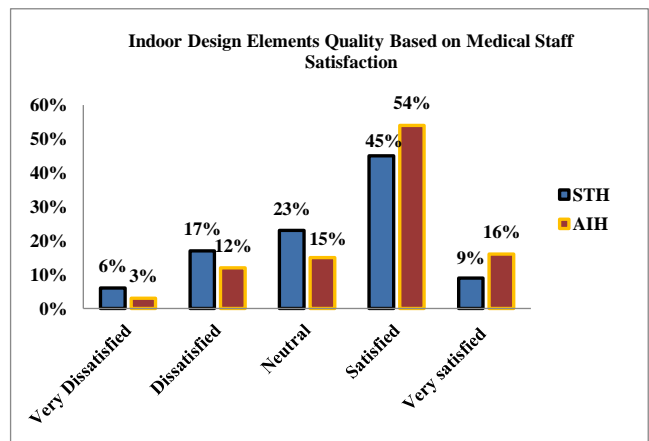


Figure 4. Medical staff's satisfaction

Table 3. Medical staff's satisfaction level according to gender.

Factors	Mean	
	Male	Female
Layout & Circulation	4.2	3.8
Infection Control	3.4	2.8
Comfort & Control	4.2	3.7
Interior Appearance	3.8	3.4
Facilities	2.1	1.8
Privacy	3.3	2.2
Views	1.5	1.1

Moreover, the results show that male medical staff were more satisfied than females. The following were the mean scores for the male population: 4.2 for layout and circulation; 3.4 for infection control; 4.2 for comfort and control; 3.8 for interior appearance; 2.1 for facilities; 3.3 for privacy; and 1.5 for views. The mean scores for female medical staff were as follows: interior appearance (3.4), comfort and control (3.7), infection control (2.8), and layout and circulation (3.8)., Facilities (1.8), Privacy (2.2), and Views (1.1) as shown in Table 3.

3.3. Results of AEDET Evolution

The research checklist (AEDET) was used to evaluate the design element qualities of the two OPDs.

Medical staff environment: This section deals with staff privacy, good views from the inside and outside, an attractive interior, comfort control, and good staff facilities. The results of the checklist showed that 85.7% and 71.4% of the respondents, respectively, agreed fairly with the mean scores of (2.14) and (1.71) for the items Privacy, and 85.7% were in fair agreement with the mean scores (2.14) for items Internal & external views at AIH and STH, respectively. The majority of the respondents 85.7% at AIH and 71.4% at STH for item Control of Comfort were in good agreement with the mean scores of (2.86) and (2.71) and 85.7% at both hospitals with mean scores of (2.86) for item Attractive interior, respectively. The findings revealed that most of the respondents, 85.7% at AIH with a mean score of (1.14) and 71.4% with a mean of (1.29) at STH, were in weak agreement with Good facilities for staff item. These results revealed higher agreement in a newly built hospital compared to the old one.

Performance: This section included easy-to-clean and Durability of finishing materials. The results showed that 100% of AIH and STH respondents with a score of (3.0) agreed with easy-to-clean. Also, 85.7% of them at AIH, with a mean score of (2.86) and 71.4% at STH, with a mean score of (2.71), agreed with the durability of finishing materials items. This result demonstrated improvements in the hospital's newly constructed indoor environmental quality.

Table 4. Results of the checklist (AEDET) for Shar Teaching Hospital (STH) and Asia International Hospital (AIH).

Section	AEDET related item (Indoor attributes)	STH	AIH
		Mean	Mean
Medical staff Environment	Privacy of staff	1.71	2.14
	Internal and external good views	2.14	2.14
	Control of comfort	2.71	2.86
	Attractive interior	2.86	2.86
	Good facilities for staff	1.29	1.14
Performance	Easy to clean	3.00	3.00
	Durability of finishing materials	2.71	2.86
Use	Optimal workflows	1.71	1.86
	Flexible and standardized space pattern	2.29	2.14
	Security layout	1.29	1.14
Space	Minimised circulation	1.14	1.29
	Necessary segregation of spaces	1.14	2.29
	Adequate storage space	2.14	2.71

Use: The Use section focused more on optimal workflows, flexible space patterns, and security layout. Results of this section showed that the

majority of the respondents 85.7% at AIH and 71.4% at STH were in fair agreement with optimal workflows and flexible space patterns with a mean score of (1.86) and (2.17) at AIH and mean score of (1.71) and (2.29) at STH, respectively. In comparison, 85.7% at AIH and 71.4% at STH, with a mean score of (1.14) and (1.29), were in weak agreement with the security layout. These results showed that the designers neglected the user's security factor, even in newly built hospitals.

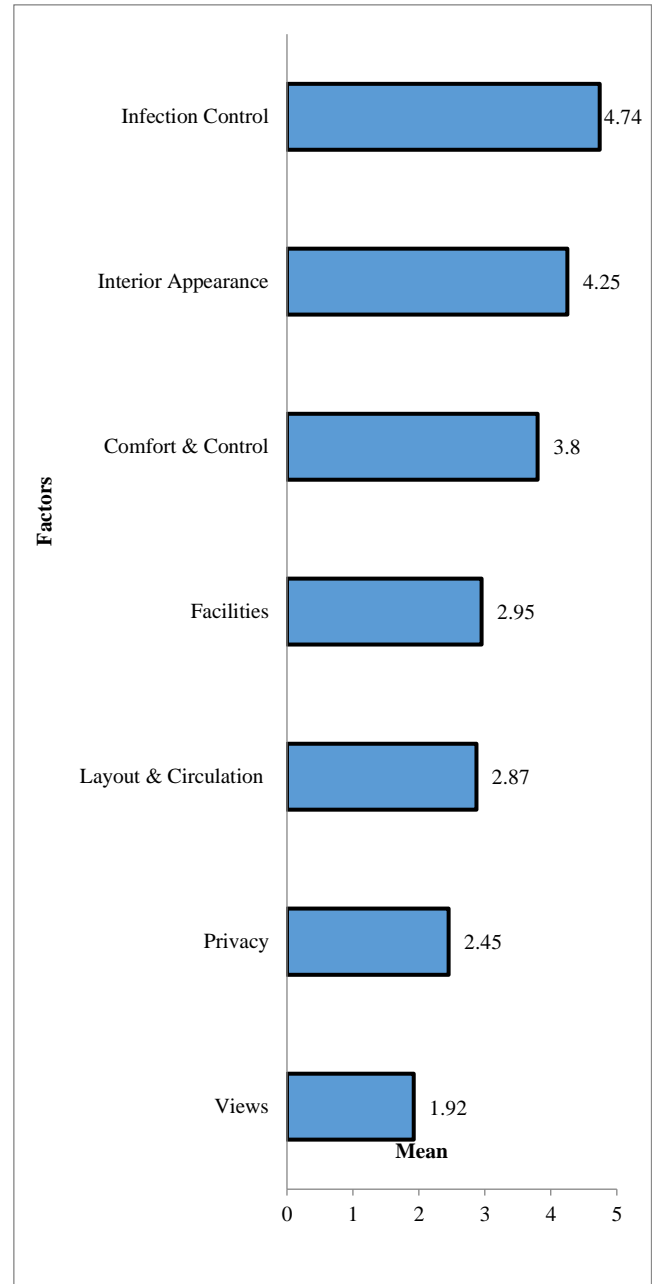


Figure 5. Medical Staff ranking for important factors.

Space: This section dealt with minimal circulation, required space separation, and sufficient storage. According to the section, 85.7% of respondents had a mean score of (1.14) and were in weak agreement with minimal circulation and the need for space segregation, whereas 85.7% had

a mean score of (2.14) and were in fair agreement with STH's appropriate storage space. Additionally, according to the AIH results, 71.4% of respondents had a fair agreement with necessary space segregation (mean score: 2.29), 71.4% had a weak agreement with minimized circulation (mean score: 1.29), and 71.4% had good agreement with adequate storage space (mean score: 2.71). These results demonstrated the impact of a new hospital design on the indoor environment's quality.

3.4. Ranking of Importance Degree of the Factors

The ratings given by medical staff for seven factors in hospital OPDs are based on how well each factor supports their performance and satisfaction. Figure 5 shows that the top four factors chosen by the respondents were Infection Control, Facilities, Interior Appearance, and Comfort and Control. The most crucial factor for improving the performance and satisfaction of medical staff was identified as Infection Control, with a mean score of (4.74), followed by Interior Appearance (4.25), Comfort and Control (3.80), and Facilities (2.95). Views received the lowest mean score of (1.92), making them the least effective element. Privacy, Layout, and Circulation had mean ratings of (2.45 and 2.87), respectively. This result shows that three of the seven elements can significantly increase the satisfaction of medical staff members and promote their performance.

3.5. Correlations between factors and medical staff Satisfaction

The fifth analytical section of the study shows that the quality of the design components, demographic data, and the level of satisfaction of medical staff at the two hospitals are interrelated. Correlational analysis used Kendall's tau correlation as the basis for factor analysis. The results indicated a significant correlation with a p-value of 0.01.

The level of satisfaction of the medical staff and the quality of the indoor environment were correlated in the first matrix. The correlation test looked into whether there was a direct link between hospital staff happiness and the caliber of the indoor design elements, as shown in Table 5. The findings showed a substantial positive association between the following factors: Good facilities ($r = 0.627$, $p = 0.01$), Easy to clean ($r = 0.805$, $p = 0.01$), Minimized circulation ($r = 0.722$, $p = 0.01$), and Control of comfort ($r = 0.695$, $p = 0.01$). Additionally, there was a moderately favorable association between adequate storage space and finish durability ($r = 0.435$, $p = 0.01$) and finish durability ($r = 0.441$, $p = 0.01$). At OPD in the examined institutions, there was a weakly positive association between staff privacy and medical staff satisfaction ($r = 0.115$, $p = 0.01$). These findings showed that the majority of the indoor environment quality items were satisfied by the medical staff, particularly those related to reducing the spread of viruses (easily cleaned, reduced circulation). It was also revealed that the higher the indoor quality, the greater the medical staff satisfaction. Table 6 illustrates the second correlation matrix that compared the patients' degree of satisfaction with the seven significant factors: layout and circulation, privacy, views, facilities, interior appearance, and infection control. The Facilities factor recorded a positively moderate correlation ($r = 0.396$, $p = 0.01$) with medical staff satisfaction, while Infection control ($r = 0.857$, $p = 0.01$), Interior Appearance ($r = 0.810$, $p = 0.01$), Comfort and control ($r = 0.763$, $p = 0.01$), and Layout and circulation ($r = 0.568$, $p = 0.01$) showed a significant positive correlation. Additionally, the findings showed a weakly positive correlation between staff privacy ($r = 0.202$, $p = 0.01$) and views at particular hospital outpatient departments ($r = 0.111$, $p = 0.01$). As a result, the results showed that the medical staff was well aware of the four factors' roles and that their performance and satisfaction rose when they were pleased with the factors of interior appearance, infection control, comfort and control, and layout and circulation in the hospital outpatient departments.

Table 5. Correlation between the indoor environment quality and medical staff satisfaction for the two hospitals

	Overall Satisfaction	Privacy of staff	Control of comfort	Attractive interior	Easy to clean	Durability of finishing	Good facilities	Optimal workflows	Minimised circulation	Adequate storage space
Overall Satisfaction	1	0.115**	0.695**	0.602**	0.805**	0.441**	0.627**	0.361**	0.722**	0.435**
Privacy of staff	0.115**	1	0.345**	0.361**	0.145	0.225*	0.261*	-0.248	0.201	0.344**
Control of comfort	0.695**	0.345**	1	0.135	0.348**	0.324**	0.301**	-0.201	0.102	0.258**
Attractive interior	0.602**	0.361**	0.135	1	0.337**	0.288**	0.156	-0.188	0.295*	0.369**
Easy to clean	0.805**	0.145	0.348**	0.337**	1	0.229*	0.285*	0.201	0.113	0.233*
Durability of finishing	0.441**	0.225*	0.324**	0.288**	0.229*	1	0.328**	-0.203	0.165	0.222*
Good facilities	0.627**	0.261*	0.301**	0.156	0.285*	0.328**	1	0.211*	0.246**	0.182
Optimal workflows	0.361**	-0.248	-0.201	-0.188	0.201	-0.203	0.211*	1	-0.128	-0.199
Minimised circulation	0.722**	0.201	0.102	0.295*	0.113	0.165	0.246**	-0.128	1	0.313**
Adequate storage space	0.435**	0.344**	0.258**	0.369**	0.233*	0.222*	0.182	-0.199	0.313**	1

Table 6. Correlation between the factors and medical staff satisfaction for the two hospitals.

Correlation matrix	Overall Satisfaction	Layout and circulation	Infection control	Comfort and Control	Interior Appearance	Facilities	Privacy	Views
Overall Satisfaction	1	0.568**	0.857**	0.763**	0.810**	0.396**	0.202**	0.111**
Layout and circulation	0.568**	1	0.605**	0.223**	0.182**	0.101*	0.416**	0.388**
Infection control	0.857**	0.605**	1	0.630**	0.216**	0.236*	0.112**	-0.289*
Comfort and Control	0.763**	0.223**	0.630**	1	0.217**	0.753**	0.191*	0.596**
Interior Appearance	0.810**	0.182**	0.216**	0.217**	1	0.330*	0.092	0.482*
Facilities	0.396**	0.101*	0.236*	0.753**	0.330*	1	0.366*	0.122*
Privacy	0.202**	0.416**	0.112**	0.191*	0.092	0.366*	1	-0.178*
Views	0.111**	0.388**	-0.289*	0.596**	0.482*	0.122*	-0.178*	1

** at the 0.01 level (2-tailed) Correlation is significant.

* at the 0.05 level (2-tailed) Correlation is significant

The third correlation was between medical staff satisfaction scores and some demographic information, as shown in Table 7. The results reveal a significant negative correlation ($r = -0.748$, $p = 0.01$) of medical staff educational attainment, a considerable negative ($r = -0.610$, $p = 0.01$) correlation of medical staff Practical experience, and a weak negative ($r = -0.171$, $p = 0.01$) relationship of the medical staff age at OPD in the selected hospitals with their overall satisfaction levels. A more negative trend was indicated by the correlation overall. Stated differently, there is a negative correlation between the age, level of education, and length of practical experience of medical staff and their satisfaction levels.

Table 7. correlation between the two hospitals' medical staff satisfaction surveys and demographic data.

Correlation matrix	Overall Satisfaction	Staff age	Educational attainment	Practical experience
Overall Satisfaction	1	-0.171**	-0.748**	-0.610**
Staff age	-0.171**	1	0.203*	0.325*
Educational attainment	-0.748**	0.203*	1	0.686**
Practical experience	-0.610**	0.325*	0.686**	1

** The correlation coefficient is significant at the 2-tailed 0.01 level.

*The correlation is significant at the two-tailed 0.05 level.

3.6 Discussion of findings

To investigate the impact of indoor design quality on medical staff satisfaction and performance in OPD, the research used quantitative qualitative and data analysis. The questionnaire was provided in English and Kurdish, with appropriate instructions given to participants, though the process took longer and the retrieval ratio was affected. The results support previous findings [8, 9] that better indoor environment quality leads to improved performance and a more satisfied and healthy environment. The study suggests that a modified EBD questionnaire, which includes CHD_CHC and ASPECT, along with an EBD-AEDET checklist, can effectively evaluate the physical qualities of healthcare buildings and factors contributing to user satisfaction. This assessment can enable designers to create better indoor environments. This finding supports

previous studies [2, 26] that highlighted the role of the indoor environment in enhancing healthcare user satisfaction. This study showed that medical staff at the newly built hospital AIH were generally satisfied with the indoor environment, compared to the older hospital STH. The OPD at both hospitals met their expectations, suggesting that the architects used updated theories, trends, and materials to improve the quality of the indoor environment. This finding is consistent with other studies that have found high levels of user satisfaction with the hospital's indoor environment [2, 14].

The study found significant differences in the factors of infection control, comfort and control, and interior appearance when comparing the medical staff's level of satisfaction at the outpatient department (OPD) in the chosen hospitals. The remaining factors showed slightly different values. (Figure 4). The medical staff at AIH, which has (a decentralized - sectoral typology) were more satisfied than the medical staff at STH, with (a decentralized - linear typology). This result is in line with a previous study [17], which indicated that decentralized-sectoral typology achieved a high level of reducing the spread of infectious pandemics, especially COVID-19, thus increasing staff satisfaction and performance. Furthermore, more consideration was paid to the quality of the AIH's indoor environment, as shown in the AEDET checklist results in Table 4. Among the AEDET checklist items related to medical staff satisfaction level at OPD in the tested hospitals (Table 4), Easy to clean had a strong positive correlation ($r = 0.805$), followed by Minimized circulation ($r = 0.722$), and Comfort and control ($r = 0.695$), then Attractive interior ($r = 0.602$). These results reported that medical staff were more concerned about Performance items (Easy to clean), Space items (Minimized circulation), and indoor environmental items (Control of comfort and Attractive interior) than the other items. This may be due to medical staff worries about the risk of infectious diseases, particularly COVID-19. This result is in line with studies [8, 17, 23] that reported that medical staff satisfaction may be strongly linked to indoor physical environment items such as cleanliness, sense of control, and attractive interior, especially during and after the COVID-19 crisis.

Current study results suggest that three factors rated by medical staff in the two hospitals are considered more critical: substantially achieving satisfaction and promoting performance, as shown in Figure 5. Infection Control, the factor that had the highest average score of 4.74 was seen as the most crucial element and exhibited a strong positive correlation ($r = 0.857$), with the medical staff's overall satisfaction. The effect of infection control in enhancing medical staff satisfaction has been pointed to in other studies conducted during and after the post-COVID-19 crisis [17, 23, 44], revealing the role of architectural design elements in preventing the spread

of infectious diseases such as COVID-19 within the indoor environment of a hospital. Interior Appearance was ranked as the second most crucial element, with a mean score of 4.25 and a strong positive association ($r = 0.810$) with the general satisfaction of the medical staff. This may result from the precise aesthetic sensibilities that define Kurdish sociocultural nature [2, 26] (natural textures, regional materials, artistic expression, and variety of color use). Previous research has shown the influence of interior design on users' pleasure [26, 33, 34, 45]. The third most important component was then determined to be Comfort and Control, with a mean score of 3.8 and a significant positive association ($r = 0.695$) with the satisfaction of the medical personnel as a whole. This result was partially anticipated because prior research has demonstrated the importance of Comfort and Control in raising staff satisfaction levels [33, 41, 45]. These findings provide healthcare building architects with evidence to inform design decisions by revealing the most important factors that may increase medical staff's performance and satisfaction levels with indoor design elements of their workplace. When gender characteristics were considered, no notable disparities in contentment were discovered between women and men in this research. With mean scores of 3.4 vs. 2.8, male medical staff members were generally more satisfied with the most crucial component, infection control. This discrepancy in satisfaction may be the result of Kurdish women's cultural preferences [2, 26], as they have higher expectations than men do for user separation in on-stage service areas (waiting, reception, exam rooms), as well as for the cleanliness of indoor spaces (clean in a sufficient manner, looking tidy and cared for). In other words, females anticipate more segregated areas between users at OPD in hospitals and regularly cleaned indoor environments. This is also true for the factors for Interior appearance mean scores of (3.84 vs 3.4) and Comfort and control (4.2 vs 3.7). These results are consistent with earlier research showing that females are more sensitive to sensations, perceive them differently, and have a more challenging time being satisfied [27, 46]. It is advised that more research be done to confirm these results. Additionally, as shown in Table 8, the results from demographic factors, including age, educational level, and staff practical experience, showed a negative link with the overall satisfaction of the medical staff. The shortest negative correlation between the age of the medical staff and their degree of satisfaction ($r = -0.171$, $p = 0.01$) was found. This result appears consistent with earlier research findings [27, 47], which found that staff satisfaction ratings marginally declined with age. Ageing-related increases in worry, fear, and stress could bring on this effect. A strong inverse relationship between overall satisfaction and educational achievement was also discovered ($r = -0.748$, $p = 0.01$). Employees with more excellent education might be more aware of their rights and demand welcoming and safe indoor environments. This outcome is consistent with earlier research that found lower satisfaction levels with hospital services and vice versa among staff members with higher education [23, 27, 47]. Prior studies [26] demonstrated that not all countries experience these demographic factors' full range of effects. Also, a significant negative correlation ($r = -0.610$, $p = 0.01$) was found between overall satisfaction and staff practical experience. Higher-experience medical staff seem more conscious of the risks of their daily contact with patients at OPD, especially after the challenges they faced during the pandemic. This finding aligns with conducted studies [23, 30], which found that the OPD staff perspective can change after experiencing the pandemic and getting more experience through their continuous work. Finally, this result reveals that some demographic characteristics can intensely affect the satisfaction level of medical staff in terms of the performance of the hospital building and the indoor physical environment. All stakeholders must understand this study on healthcare facilities. However, evaluating only two hospitals in Sulaimani City limits the study's findings. The concept of "evidence-based design" is new in the Kurdistan Region, and this study aims to promote its implementation in building healthcare facilities. Future research must be

conducted to validate the findings and compare them with other nations. More research is needed to confirm the coherence of the questionnaire with users' satisfaction levels.

4. Conclusion

This study evaluated the connection between indoor design, medical staff satisfaction, and hospital performance. Evidence-based design (EBD) was used as an assessment tool to identify key satisfaction factors. The study applied EBD toolkits to confirm that the indoor environments of two OPDs in Sulaimani City effectively meet the design goals and improve outcomes. The questionnaire outcomes showed that seven factors significantly affect medical staff satisfaction and performance in the workspace. These factors include Layout and Circulation, Infection Control, Comfort and control, Interior appearance, Facilities, Privacy, and Views. Based on the respondents' perspectives and experiences, Infection Control, Interior appearance, and Comfort and control were the most critical factors in promoting staff satisfaction. Further research is needed to quantify and qualify these factors. The study found that sociocultural views and the COVID-19 pandemic significantly affect medical staff satisfaction. Infection Control was ranked as the most significant factor, followed by Interior appearance and Comfort and control. Additionally, medical staff's satisfaction level can vary based on their demographic information, and a negative correlation was found between personal information and overall satisfaction. Architects and designers can use the results of this study to reduce epidemiological risks and improve infection prevention in hospitals, especially in the OPD. The study's findings can also help architects and interior designers familiarize themselves with POE toolkits and decrease the risk of dissatisfaction in medical staff while increasing their work satisfaction. Consequently, the study suggests that incorporating the factors tested in EBD can improve medical staff satisfaction and OPD performance, leading to a better indoor healing environment. This can influence design guidelines and provide opportunities for architects and designers to adopt the study's results as a benchmark for future designs.

Contribution of the authors

Each author made an equal contribution to the writing of this article.

A statement of conflicting interests

The writer states that there is no conflicts of interest in this research.

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Data accessibility

The corresponding author will provide the data supporting the study's conclusions when requested.

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