2024
March
coou African Journal of Environmental Research *Vol 5, No. 1, 2024. pp 144-158*

ADDRESSING THE PHYSICAL ENVIRONMENTAL STRESSORS IN NIGERIAN GENERAL HOSPITALS TO FACILITATE PATIENT CARE, WELL-BEING AND EFFECTIVENESS OF HEALTHCARE GIVERS

Sani Muhammad Ali[1] & Abdullahi Aisara[2]

[1&2]*Department of Architecture, Bayero University, Kano, Kano State, Nigeria*

Email: smali.arc@buk.edu.ng, aaisara.arc@buk.edu.ng

Abstract

The current trend of healthcare design has now gone beyond providing spaces for the treatment of ailments and functional efficiency, but providing a hospital environment that is supportive in nature to healthcare outcomes through evidence-based design. Stress, as a common experience in healthcare settings, is found to be a burden to clinical staff, patients, as well as their families, and the hospital's physical environment is found to be one of the causes of this phenomenon. Despite the tendencies of the healthcare environment to worsen or reduce stress, very little attention has been paid to its role in causing stress in Nigeria. In this regard, this research is aimed at addressing the environmental stressors in healthcare designs in general hospitals. This was achieved by exploring the stressors themselves and their effects in four (4) general hospitals in Kaduna State, in February 2021 through interview and observation. Twenty-four healthcare personnel involving nurses and doctors were interviewed at the purposively sampled hospitals: Hajiya Gambo Sawaba, Giwa, Kauru and Sarkin Maska Shehu in Funtua. The data was analysed using content analysis and found that environmental stressors were more ambient and facility layout-related. It was also found that there was a less conscious attempt to use stress-reducing measures in minimising stress on the users. Therefore, it becomes pertinent to use design strategies and elements inherent in stress-relieving effects to minimise stress in future designs of general hospitals in the country.

Keywords: Caregivers, Environmental stressors, General hospital, Healthcare

INTRODUCTION

The World Health Organization in 1946 defined health as a condition of the whole physical, mental and social well-being, rather than simply the absence of sickness and infirmity (Oloche, 2015 & Christer, 2013). However, the well-being of the users is undermined in the healthcare environments leading to an unfavourable condition and stressful experience, and this consequently affects the healthcare outcomes.

Stress is one of the major problems experienced in public healthcare settings in Nigeria which causes burnout of caregivers and ultimately affects patients' recovery. Ulrich, Zimring, Zhu, DuBose, Boseo, Choi, Quan, and Joseph (2008) stated that problems relating to the physical architectural environment, work overload, anger formed during interactions with patients or

their relatives, being exposed to health and safety hazards, lack of support from hospital administration were identified as stressors. the lack of due consideration in addressing clinical stressors and enhancing the well-being of the users in this intermediate tier of healthcare settings in the country results in frequent referral to the higher tiers (tertiary hospitals), which eventually over-crowd them leading to more stress. Even though stress is known to be attributed to the above factors, this research focussed only on the stressors relating to built environments.

Caregivers' work environments must be supportive of their profession and responsive to their specific demands, as any insufficiency in the physical environment can contribute to staff discomfort, stress, and burnout, as well as medical errors. So, as Ulrich et al. (2006) stated, the built environment of a well-designed hospital promotes improved clinical outcomes, boosts safety, and decreases stress for both patients and staff.

However, despite the growing evidence on the tendencies of the physical healthcare environment to worsen or reduce stress, very little attention has been paid to the role of these environments in our local context. Although there is research conducted regarding the staff experiencing stress in other fields of study like nursing and medical sciences, little emphasis is given to stress-reducing strategies in a healthcare environment (Ulrich et al., 2004; Christer & Alaster, 2013).

Therefore, the design of an improved healthcare setting plays an important role in making hospitals less distressing, more healing for patients, and a better working place for staff. Thus, a holistic approach from all fields in addressing the stress may decrease the burnout of caregivers in the healthcare sector as well as the patients' long stay while admitted. In summary, this research is focused on addressing the physical built environment-induced stressors in Nigerian general hospitals to facilitate patient care and the well-being, productivity, and effectiveness of healthcare personnel. This was achieved through exploring stressors in healthcare physical environments, determining the effects of these stressors on clinical staff, and recommending stress-reducing measures.

LITERATURE REVIEW

Stress is defined as a non-specific response of the human body to any demand made upon it (Chhari & Mehta, 2016, Fink, 2017). Fink (2017) went on to state that stress as an external factor or stimulus causes physical, emotional, or mental discomfort in employees.

Consideration of the physical environment is important as it can cause stress by influencing individual needs (Rashid & Zimring, 2008). As jobs have changed, many hospital settings have not been rethought, and as a result, hospital design frequently increases staff stress and reduces their effectiveness in providing care (Ulrich & Zimring, 2004). Poor design can undoubtedly cause psychological and physiological discomfort, whereas good design mitigates negative effects (Ulrich, 1991). According to Edem, Akpan, and Pepple (2017), unsafe health facility environments such as unsuitable furniture, poorly designed workstations, lack of ventilation, excessive noise, inappropriate lighting, poor supervisor

support, poor workspace, poor communication, poor fire safety measures for emergencies, and a lack of personal protective equipment can reduce employee productivity. They also claim that health workers in such settings are vulnerable to occupational syndromes such as stress, deafness, ergonomic disorders and suffocation.

Similarly, the hospital environment contributes to the stress of both patients and staff. Patients, like staff, have physiological, psychological and psychosocial needs in hospital settings, which if not met to a certain level may cause stress in the patients. Rashid and Zimring (2008) developed a conceptual framework illustrating how the physical environment may set in motion a process leading to stress in healthcare and office settings. This is illustrated in Figure 1.

Ambient Environmental Factors

According to Malkin (2008) environmental factors also known as environmental stressors include noise, glare, lack of privacy and poor air quality among others. These stimuli or factors appear to be determinants of indoor environmental comfort, while discomfort can lead to or contribute to additional stress. Eijkelenboom and Bluyssen (2019) stated that these stress reactions may differ between occupants due to demographic differences, duration of exposure, physiological characteristics, social aspects and previous experiences and exposures.

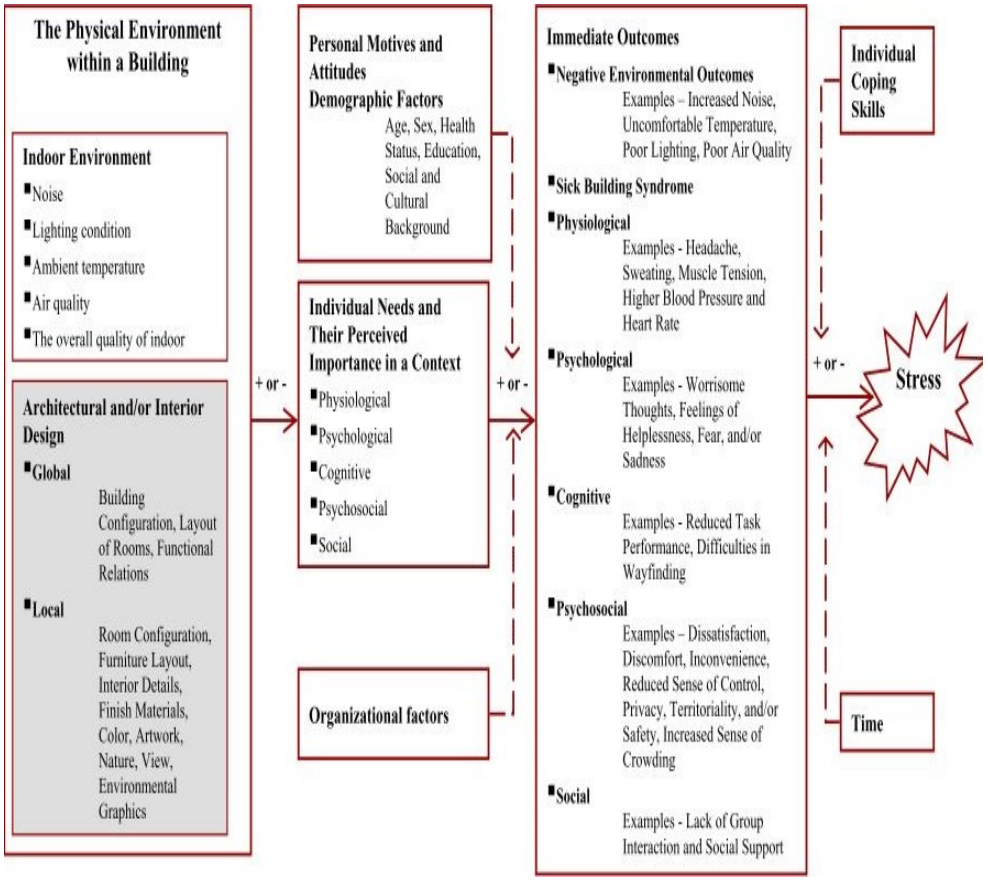

Figure 1: Conceptual Framework on Physical Environment Process Leading to Stress

Source: Rashid and Zimring (2008)

Noise as a stressor in hospitals

It has been established that noise is one of the pervasive stressors that burden not only patients and their families but also workers involved in direct patient care. Noise, according to Ulrich et al. (2006) is a stressful latent environmental condition that increases fatigue and job strain and, in some clinical situations, increases the risk of error for staff. It is also linked to sleep loss and fragmentation, high blood pressure, a lower rate of recovery from a myocardial infarction, and lower oxygen saturation in neonatal intensive care infants. Noise is generated from different sources which are either from the hospital's internal and external environments, disruptions caused by loud roommates in multi-bed rooms, noise from a busy road, a market near the hospital, and so on.

It has been shown that hospital noise levels around the world are far too high, with decibel intensities far exceeding WHO guideline values (Ulrich et. al., 2006). Some studies that measured noise levels in hospital settings found that background noise levels in hospitals were in the range of 45 dB to 68 dB, with peaks frequently exceeding 85 dB to 90 dB (Joseph, 2006). This is significantly higher than the 35 dB values recommended by World Health Organization guidelines (Berglund, Lindvall & Schwela, 1999). In this regard, it is therefore imperative that healthcare building project owners place a high priority on creating much quieter environments. Lower noise levels were associated with a variety of positive effects on employees, including decreased perceived work demands, increased workplace social support, improved patient care quality and improved speech intelligibility (Ulrich et. al., 2004).

Lighting as a stressor in hospitals

A study of workers' productivity levels discovered that daylight has a positive effect on work performance in a windowed office environment and is generally recognized as part of a healthy environment (Aripin, 2006). Onosahwo, Chukwuemeke and Stephen (2016) affirmed that the quality of a visual environment has a positive effect on the occupant's sense of well-being in healthcare buildings, which can affect staff performance and patient recovery. Joseph (2006) stated that daylighting has been specifically linked to improved attention and mood, as well as reduced strain, anxiety, tiredness and eyestrain. It is clear from the preceding positive effect of optimal lighting level that its adequacy can never be over-emphasized in a hospital setting in reducing stress.

Thermal discomfort as a stressor in hospitals

Thermal discomfort in healthcare facilities is of great concern as it serves as a source of unwanted physiological strain on the body, even though the thermal comfort of patients differs from that of a healthy population (Ackley & Akpan-Idiok, 2017). Research in a Belgian healthcare facility found that a poor thermal healthcare environment can induce physiological strain on patients, which can further induce extra stress to the patient, which is undesirable unless medical treatment requires it (Ackley & Akpan-Idiok, 2017). However, because people with different activities must coexist in the same thermal conditions, achieving thermal comfort that is suitable for all becomes extremely difficult (Ferraro, 2015). As a result, thermal comfort in the healthcare environment must be calibrated by considering two distinct groups of people: patients, who generally have low metabolic rates, and medical

staff, who have higher metabolic rates and lower clothing insulations when compared to patients (Ferraro, 2015).

Unit configuration as a stress contributor

Walking distance is one of the most stressful tasks performed by healthcare givers, and it affects the expected patient care. This is influenced by the spatial layout, such as the proximity of related functions and ancillary facilities. Internal layout can be designed to increase or decrease the time staff spends going around the ward for medication, materials supply and other ancillary patient care activities. This is supported by Hendrich, Fay, and Sorrells (2004) as well as Joseph (2006) who confirmed that the efficient unit design reduced walking and supply trips, allowing for a reduction in budgeted staffing care hours while increasing time spent on direct patient-care activities. According to Joseph (2006) bringing staff and supplies physically and visually closer to the patients reduces the amount of time spent walking.

Strategies for mitigating the effects of environmental stressors

There is scientific evidence which confirms that the traditional ways in which hospitals are designed contribute to stress; however, improved physical settings can be an important tool in making hospitals safer, more healing and better places to work (Ulrich et al., 2004). Ulrich (1991) proposed that psychologically supportive design can alleviate stress caused by a lack of control, whether the concern is for staff, patients, or visitors, this is by implementing strategies that promote a sense of control. He further added that examples of design approaches that increase the sense of control include providing gardens or grounds that are accessible to patients and staff, and staff workstations designed and located to avoid frequent and unnecessary interruptions by visitors.

Indoor environmental comfort as a stress mitigation in hospitals

The quality of an environment that is comfortable in terms of ambient features is known as indoor environmental comfort. The environmental comfort model states that a workspace either supports the tasks and activities performed in it or fails to support them and thus slows them down due to uncomfortable conditions of stress (Vischer, 2017). Different ambient factors such as noise level (acoustical comfort), temperature level (thermal comfort), light (visual comfort), air quality and ventilation influence indoor environmental comfort (Ali, 2021). Heidi, Marjaana, Nevala, Lappalainen, Knibbs, Morawska and Kari (2013) argued that psychological and physiological stress can be reduced by reducing the noise level through the use of noise-reducing finishes such as high-performance sound-absorbing ceiling tiles or by architectural features such as single-bed patient rooms and short corridors.

Apart from a shift from an open-bay ward system to a single patient room occupancy system; other acoustical measures also play vital roles in reducing the level of noise as well as sound propagation. A priority should be placed on creating a much quieter environment by

separating patients into single rooms, insulating or eliminating noise sources and installing high permanent sound-absorbing materials on ceiling and wall surfaces (Ulrich et al., 2006).

Improving natural lighting and ventilation is also important in achieving an indoor environment that is visually and thermally comfortable. According to Alimoglu and Donmez (2005), spending at least three hours a day in natural light can reduce stress and increase satisfaction. By providing pleasing and calming views, visual comfort can be improved. In addition to calming views and provision of hospital gardens and family involvement in patient care, hospitals should provide more public spaces that facilitate social interaction, such as lounges, atria and interior streets with shops, etc., that were not previously available in the hospital environment (FEMA, 2007).

General layout, shape, size and accessibility design to reduce stress

The shape of a unit, its layout, as well as the number of interruptions within the spatial relationship impact the number of interactions and stops due to increased visibility and a higher likelihood of crossing paths with other staff (Yi & Seo, 2017). According to Delucia et al. (2009), more trips were made within the nurses' area than between patients' rooms and interruptions occurred frequently, resulting in additional walking. In a comparative study of intensive care units, it was shown that a circular design provided nurses with greater visibility of patients and less travel in hallways, resulting in greater satisfaction by nursing and surgical staff, as well as patients and their families, than a rectangular shaped design (Delucia et. al., 2009). This was also supported by Seo, Choi and Zimring (2011) that observational studies revealed less walking distance and time in units with global visibility, particularly in circular and octagonal shape forms when compared to other units without global visibility.

Nigerian Hospital System

The Nigerian health system is based on a three-tiered government structure (Federal, State and Local Government Area), each with significant autonomy (Uzochukwu, Chinyere, Chinyere, Ibe & Chinenye, 2016). Hospitals in the country are also divided into three types: primary, secondary, and tertiary. Dispensaries, clinics, and primary healthcare centres are examples of Primary Health Care Centres (PHCs), whereas general or district hospitals are examples of secondary healthcare centres. Tertiary Hospitals include Federal Medical Centers (FMCs), Specialist Hospitals (SPs), and University Teaching Hospitals (UTHs). The general hospital is an intermediate tier that serves as a link between PHCs and tertiary hospitals such as FMC and UTHs. It provides health services that are too complex for primary care clinics and refers more complex cases that exceed its capacity to tertiary healthcare institutions (McKee & Healy, 2002).

The architecture of a hospital in the country is divided into several units and departments, with a hierarchy in the relationship between one unit/department and another. The units are related based on the functions they serve and a single unit can have multiple departments. Administrative units, outpatient units, diagnostic, and treatment units, inpatient units,

services, and occasionally research and teaching units are found in teaching or specialist hospitals as well as general hospitals except research and teaching.

The outpatient unit, which is usually for short visits of less than a day consists of outpatient clinics, pharmacies, emergency rooms and bed-related inpatient functions, which are usually required for at least one night's stay in a ward. Laboratories, Radiology and Physical Therapy are part of the diagnostic and therapeutic services division. The internal medical treatment division includes operating rooms, intensive care units, maternity sections and central sterilization departments, whereas the inpatient division includes patient wards, nurse wards and inpatient services.

METHODOLOGY

Case study research was adopted in the form of a semi-structured interview. This is because it allows the participants to voice their best experiences of stress without being restrained by any viewpoints from the researcher (Cresswell, 2012). It was also advantageous as respondents were able to create options for responding, more so the interviewer had control over the types of information to be received. A face-to-face interview was similarly adopted as high-quality data could best be achieved through it even though it is very labour-intensive (Mathers, Huun, & Fox, 2007). The interviewees in this regard were resident nurses and resident doctors as they are in direct care of the patient.

The process of gathering open-ended and first-hand information by observing people and places at a research site is known as observation (Cresswell, 2012). In this research, observation was also used to gather such data that may not be obtained through the interview, or that the information obtained will strengthen the data obtained from the interview. This was done by going around the sections relevant to this research gathering the relevant information needed and backing it up with photographs in the purposively sampled case studies.

The researcher visited four purposively selected samples of existing general hospitals in Kaduna State: Hajiya Gambo Sawaba in Zaria, at Giwa, at Kauru and Sarkin Maska Shehu in Funtua and carried out interviews as well as observation in each of them. The respondents were asked questions developed and filed by the researcher in the interview guide and the responses were then recorded. The tape recording was used to record interview data in the research. The data was then transcribed verbatim for analysis. Photographs and sketches were made where possible and necessary; field notes from the observation were prepared to assist in the analysis.

Through observation, the researcher was able to appraise the extent to which stress-reducing measures, especially regarding patients, were implemented in the sampled case studies. This was achieved by developing a checklist of stress-reducing measures recommended by other researchers. The attributes observed include the type of ward layout design as well as its occupancy, internal and external configuration of the units, social support, provision of acoustical measures and other ambient features.

The data was analysed using rationale content analysis to determine the presence of certain words, features or concepts within the texts, field notes and images among others. It also enabled the researcher to quantify and analyze the presence, meanings and relationships of such words and concepts to deduce an inference about the data. On the other hand, the data obtained from the observation was analysed using conceptual content analysis based on the quantity and presence of the feature/criteria assessed in the observation. In a nutshell shell, the data was analysed descriptively. The results from both the observations and interviews of the case studies were presented in tables.

RESULTS AND DISCUSSION

Noise, insufficient lighting, and lack of ventilation were found to be the main stressors related to ambient features while walking distance by the clinical staff was found to be the main stressors related to the general layout of hospitals. Therefore, ambient features of the physical environment and architectural design features were found to be the major factors causing stress. Categories of stress effects on clinical staff were established by categorising the related codes from the transcribed interview themes. Themes that are related were grouped into one category. The group of categories were further categorised into domains as shown in Table 4.1.

Table 4.1: Categories of Stressors Found in the Healthcare Settings

S/N	THEMES	CATEGORY
1.	Noise	Stressors related to ambient features
2.	Insufficient lighting and lack of ventilation	
3.	Walking distance	Stressors related to architectural general layout

Source: Fieldwork (2022)

Stressors Related to Ambient Features

The study identified features that are related to the feeling or mood associated with a particular environment. Noise, lack of air quality (lack of ventilation) and insufficient lighting are the atmospheric features related to the physical environment expressed as stressors by the respondents.

Noise as a stressor

In one of the case studies, environmental noise generated from a market and a busy road near the hospital was identified as the source of noise. In addition to the noise generated within the hospital environment, this contributes to environmental stress for healthcare users. There were times when the noise became alarming, as confessed by one of the doctors: “When it gets worse sometimes you have to wait till the noise gets less then you continue with your work”. This can be seen in Table 4.2 where the noise has the highest responses in contributing the

stress. All doctors and 93% of the nurses from all case studies were of the view that noise is disturbing and mind-distracting while on duty. This has been the popular view of 95.83% of all the clinical staff. The result also indicates that there is not much difference between the nurses and doctors across the four case studies on the perception of noise being a stressor. However, one respondent among the nurses in case study three had a contrary opinion as shown in Table 4.2.

Table 4.2: How Noise Contributes to Stress to Healthcare Givers

S/N	CODES	Case study 1	Case study 2	Case study 3	Case study 4	Doctors' % (N=9)	Nurses' % (N=15)	TOTAL % (N=24)
1.	Disturbance and mind distraction	6	6	5	6	9 (100%)	14 (93%)	95.83%
2.	Affects workers efficiency	1	1	1	2	3 (33%)	2 (13%)	20.83%
3.	Affects patients' moods and triggers their ailments	3	2		1	2 (22%)	4 (27%)	25.00%
4.	Medication error	2	1		1		4 (27%)	16.67%

Source: Fieldwork (2022)

The percentages of staff whose efficiency was affected by noise were 13% for nurses and 33% for doctors. This shows that noise causes disturbance which can lead to delay in discharging their duties due to interruption. Furthermore, 16.67% of the respondents were of the view that noise causes mind distraction leading to medication error.

Users satisfaction with lighting and ventilation

Lighting and ventilation are among the variables used in building performance evaluation to measure the users' satisfaction as a determinant of visual and thermal comfort (Ali, 2021). The inadequacy of these attributes contributes to stress for the occupants (Verheyen, 2011 Aripin, 2006). The levels of satisfaction with natural lighting and ventilation in the respective workplaces of the respondents were 87.50% and 79.17% for natural lighting and natural ventilation respectively as depicted in Table 4.3.

Table 4.3: Users Satisfaction with Lighting and Ventilation

S/N	CODES	Case study	Case study	Case study	Case study	Doctors' %	Nurses' %	TOTAL %

		1	2	3	4	(N=9)	(N=15)	(N=24)
1.	Satisfied with natural lighting	4	6	6	5	7 (78%)	14 (93%)	87.50%
2.	Satisfied with artificial lighting	2	0	3	5	5 (55%)	5 (33%)	41.67%
3.	Satisfied with natural ventilation	3	6	6	5	5 (55%)	14 (93.5%)	79.17%
4.	Satisfied with artificial ventilation	2	0	3	5	5 (55%)	5 (33%)	41.67%

Source: Fieldwork (2022)

There was a general dissatisfaction among the respondents as only 41.16% expressed satisfaction with both artificial lighting and ventilation, as shown in Table 4.3. 55% of the doctors were satisfied with artificial lighting and ventilation but only 33% of the nurses were satisfied with them. Although there was the use of alternative sources of electricity (solar installations and active standby generators) in all the case studies, they were however dedicated to certain units of the hospitals such as OPD and laboratories. This might be the reason why the majority of those found satisfied with artificial lighting and ventilation were respondents working in those units.

Architectural Design Stress-Related Features

Architectural design features are also important factors affecting the behaviour and comfort level of hospital users. This research explored how the internal and external layout of the hospitals add to clinical staff stress. The result indicates that the architectural layouts of the hospitals add to the clinical stress. The distance covered by staff is determined by the architectural layout or design of the hospitals, so, the spatial layout can lengthen or shorten the distance they cover. Therefore, it is the view of the clinical staff that the distances they cover add to their stress, and this is further discussed below.

Walking distance

Frequent movements that healthcare personnel get involved in, either within the ward or between the units, add to their stress. This is as narrated by one of the respondents *"... but here ……. the nurses' station is not together with the ward, so you have to go down to attend to patients, that movement is very stressful. It will be better if we can have things nearby".* The result shown in Table 4.4 indicates that 54.17% of the respondents were of the view that such movement is stressful.

Table 4.4: Respondents' View on Walking Distance on Stress

S/N	CODES	Case study 1	Case study 2	Case study 3	Case study 4	Doctors' % (N=9)	Nurses' % (N=15)	TOTAL% (N=24)

1.	Depends on the layout and unit of the work	3	0	0	0	1 (11%)	2 (13%)	12.50%
2.	The movement to patients' areas, supplies, and other units is stressful	1	5	4	3	3 (33%)	10 (67%)	54.17%
3.	Movement not stressful	2	1	2	3	5 (56%)	3 (20%)	33.33%

Source: Fieldwork (2022)

12.50% of the respondents were of the view that the stress on staff is a factor in the layout and unit of their workplace. This was deduced to be the view of those who had the experience of other wards/units or had the experience of other hospitals, and surprisingly 33.33% did not see such movement as stressful. 56% of those having the opinion that such movement was not stressful were doctors, while 11% of them were of the view that it depends on the unit layout. This may be because doctors spend most of their time at OPD having consultations with outpatients, or at the inpatient unit during the ward round. On the other hand, 67% of nurses were of the view that such movement was stressful and 20% of them opted otherwise. Therefore, it can be deduced that such movement was more stressful to the nurses than to doctors, implying that nurses are subjected to more walking than doctors in our hospital settings.

Stress Affecting Clinical Staff's Productivity and Wellbeing

The result of the interview indicated that the effects of stress on clinical staff are in categories. Some of the effects were concerned with patient care, while others were related to workers' well-being. The results further show that the workers employ various ways to cope with stress, as illustrated in Table 4.5.

Table 4.5: Categories of Stress Effects on Clinical Staff

S/N	THEMES (effects)	Category
1.	Stress affects workers' performance and efficiency	Effects on patient care
2.	Causes medication error	
3.	Affects workers' attitudes and mood	Effects on workers'
4.	Affects workers health	wellbeing
5.	Increases tiredness and exhaustion	
6.	Affects me but I am adapted to it	Coping mechanism

Source: Fieldwork (2022)

Effects of Stress on Patients' Care

One of the doctors made the following statement while responding to how stress affects his productivity and well-being; "*Well, it is a normal thing for every human being, the more stressful you are the less productive you will be and of course, it affects one's wellbeing and health status*". This summarizes the way stress affects clinical staff's productivity and well-being. The result from Table 4.6 indicates that clinical staff perceived stress as disturbing in terms of their performance and efficiency. 60% of nurses and 55% of doctors were of the opinion that stress was affecting their performance and efficiency. Even though unpopular, the result shows that 22% of the doctors and 7% of the nurses were of the view that stress causes medication error.

Table 4.6: Effects of Stress on Patients' Care

S/N	CODES	Case study 1	Case study 2	Case study 3	Case study 4	Doctors' % (N=9)	Nurses' % (N=15)	TOTAL% (N=24)
1.	Stress affects workers' performance and efficiency	2	3	5	4	5 (55%)	9 (60%)	58.33 %
2.	Causes medication error	0	0	2	1	2 (22%)	1 (7%)	12.50 %

Source: Fieldwork (2022)

Effects of Stress on Workers' Wellbeing

The study further found out that staff's wellbeing was affected in different ways due to the stress they experience; leading to tiredness and exhaustion, thus affecting their attitude and mood as well as their health condition. 54.17% of the respondents had the view that tiredness and exhaustion affect wellbeing, with nurses having more of such experience than doctors. This is as shown in Table 4.7.

Furthermore, stress was also found to affect the health conditions of healthcare workers, as 41.67% of the staff agreed with this view, that they experienced headache, leg pain, back pain, or lethargy. The result indicates that nurses complain more about health issues than doctors. Similarly, even though unpopular, the result indicates that only 8.17% of the respondents complained that stress affects their attitude and mood and this concerned only doctors in case studies 1 and 4, as depicted in Table 4.7

Table 4.7: Stress Effects on Patient Care

S/N	CODES	Case study 1	Case study 2	Case study 3	Case study 4	Doctors' % (N=9)	Nurses' % (N=15)	TOTAL % (N=24)
1.	Stress affects workers attitudes and mood	1	0	0	1	2 (22%)		8.17%
2.	Affects workers health	1	2	5	3	3 (33%)	7 (47%)	41.67%
3.	Increases tiredness and exhaustion	3	4	3	3	4 (44%)	9 (60%)	54.17%

Source: Fieldwork (2022)

Stress Coping Mechanisms

The strategy used by the healthcare staff in coping with stress is referred to as a coping mechanism. One of the respondents confessed that the main strategies they employed in coping with the stress was that; "*It affects me, but the reality is you have to learn to try and adapt to it*". From this confession, it

can be deduced that adaptation is the major method of coping with stress by healthcare personnel. This implies the need for other alternative approaches/strategies that will help them in relieving and coping with the stress.

CONCLUSION

This study reviewed relevant literature and collected data through semi-structured interviews and non-participatory observation in four purposively selected general hospitals in Kaduna State. The study found that environmental stressors that have a direct bearing in healthcare settings are of two categories; the ambient and those related to spatial layout. Noise, insufficient lighting and lack of ventilation are the major attributes related to ambient features that add to clinical stress in Nigerian healthcare settings, with noise causing more disturbance and mind distraction. Walking distance, especially by nurses, was the main way in which the architectural spatial layout of the hospital and its units added up to stress even though the level of stress it induced might depend on the layout and unit of the work.

The research has further found that stress has effects on patients' care and staff wellbeing in healthcare settings. This is by affecting workers' productivity and well-being as well as causing medication errors which adversely affect patients' care. Workers' well-being is affected by tiredness and exhaustion, affecting workers' attitudes and mood in addition to health effects. This consequently affects the workers' productivity in discharging their duties. The study also found out that adaptation was the main strategy adopted by clinical staff in coping with stress, however, a conducive and comfortable environment, a view of nature and having a short break for relaxation were found to be effective strategies for stress mitigation.

Design strategies such as reducing the number of occupants per room, to single occupancy rooms, were not found, but the open-bay ward system was mostly used in the general hospitals. Similarly, a single corridor system is used instead of a radial ward layout system. In contrast, an acoustical measure of not linking the main circulation with high sound traffic was found to be used to some extent. However, staff-patient supporting facilities such as space for patient family, social area, garden, common room, etc. that are known to have stress-relieving effects, were inadequately provided.

Therefore, it can be concluded that there are features of a physical environment that add up to clinical stress which need to be addressed to improve the productivity and well-being of the healthcare givers and quicken healing in patients.

RECOMMENDATIONS

Since the hospital setting contains stressful features and that stress leads to unfavourable conditions that affect patients' care and the well-being of the clinical staff, the research, therefore, recommends the following:

1. Stressors, such as noise and long walking distances and their effects, should be considered while designing a hospital, thereby reducing or eliminating them.
2. Supporting facilities for both clinical staff and patients (e.g., spaces for patients' families, social area, and staff common room) as well as landscaping elements with stress-relieving effects should be effectively considered in hospital design.

3. The ward layout should be redefined by reducing the number of patients per room and decentralizing the locations of the nurses' station and supplies area to reduce their walking distance.
4. Similarly, the location of supporting units such as the pharmacy, radiology, payment area and laboratories should also be located in such a way that they are in proximity to both the inpatient and outpatient departments, this will also reduce the walking distance for patients and their families while patronising the services.

REFERENCES

Ackley, A., & Akpan-idiok, P. (2017). Sustainable therapeutic environment: Impacts of the indoor environment on users' perception of wellbeing in public healthcare facilities in Calabar municipality, Nigeria. *Sustainable Therapeutic Environment ; Impacts of the Indoor Environment on Users* '. (June).

Alimoglu, M. K., & Donmez, L. (2005). Daylight exposure and the other predictors of burnout among nurses in a university hospital. *International Journal of Nursing Studies,* 42(5), 549–555.

Ali, S. M. (2021). Evaluating Neutral, Preferred and Comfort Range Temperatures and Computing Adaptive Equation for Kano Region. ARCHICULTURE, *An International Journal that Promotes the Architecture of Human Culture with the Culture of Architecture.* A publication of the Department of Architecture, Faculty of Environmental Sciences, University of Jos, Nigeria.

Aripin, S. (2006). Healing architecture: a study on the physical aspects of healing environment in hospital design. (Weber 1995), 342–349.

Berglund, B., Lindvall, T., & Schwela, D. H. (1999). Guidelines for community noise. *World Health Organization: Protection of the Human Environment*.

Chhari, N., & Mehta, S. C. (2016). Stress Among Patients During Hospitalization : A Study From Central India. 7(4).

Cresswell, J. W. (2012). *Educational Research: Planning, conducting and evaluating Quantitative and Qualitative Research*. Pearson Education, Inc.

Cresswell, J. W. and, & Creswell, J. D. (2018). *Research design: Qualitative, Quantitative, and Mixed Method Approaches* (fifth edit). SAGE Publication Ltd.

Delucia, P. R., Ott, T. E., & Palmieri, P. A. (2009). Performance in Nursing. (June). https://doi.org/10.1518/155723409X448008

Edem, M. J., Akpan, E. U., & Pepple , N. M. (2017). Impact of Workplace Environment on Health Workers. *Occupational Medicine and health Affairs, 05*, 1-5.

Eijkelenboom, A., & Bluyssen, P. M. (2019). Comfort and health of patients and staff, related to the physical environment of different departments in hospitals : a literature review. *Intelligent Buildings International*, 0(0), 1–19. https://doi.org/10.1080/17508975.2019.1613218

FEMA. (2007), Hospital design considerations. 1–32.

Ferraro. S, (2015). A field study on thermal comfort in an Italian hospital considering differences in gender and age. *Applied Ergonomics*, 2015; 177-184.

Fink, G. (2017). Stress : Concepts, Definition and History. (January), 0–9. https://doi.org/10.1016/B978-0-12-809324-5.02208-2

Heidi Salonen, Marjaana Lahtinen, Nina Nevala, Luke D. Knibbs, Sanna Lappalainen Lidia Morawska & Kari Reiula (2013). Physical characteristics of the indoor environment that affect health and wellbeing in healthcare facilities: A review. *Article in Intelligent Buildings International*. page 3-5 January 2013. https://doi.org/10.1080/17508975.2013.764838

Hendrich, A. L., Fay, J., & Sorrells, A. K. (2004). Effects of acuity-adaptable rooms on the flow of patients and delivery of care. *American Journal of Critical Care*, 13(1), 35–45.

Joseph, A. (2006). The Role of the Physical and Social Environment in Promoting Health, Safety, and Effectiveness in the Healthcare Workplace. (November).

Malkin J. (2008). Evidence-Based Design: A Visual References for Evidence-Based Design.

Mathers, N., Huun, A., & Fox, N. (2007). Surveys and Questionnaires Authors.

Mckee, M. & Healy, J. (2002). Hospitals in a changing Europe, Philadelphia. Open University Press.

Oloche, O. M. (2015). Architectural Response to Emergency Care in the Design of Emergency Care (Unpublished thesis). Available at ABU Thesis Data Base.

Rashid, M., & Zimring, C. (2008). A Review of the Empirical Literature on the Relationships between Indoor Environment and Stress in Healthcare and Office Settings : Problems and Prospects of Sharing Evidence. 2(2), 151–190.

Seo, H., Choi, Y., & Zimring, C. (2011). Impact of Hospital Unit Design for Care on Nurses' Behavior. https://doi.org/10.1177/0013916510362635

Ulrich, R. S. (1991). Effects of interior design on wellness: Theory and recent scientific research. *Journal of Health Care Interior Design*, 3(1), 97–109.

Ulrich, R. S., Zimring, C., Quan, X. & Joseph, A. (2006). The environment's impact on stress. In S. Marberry (Ed.), Improving Healthcare with Better Building Design. Chicago: Health Administration Press, 37–61.

Uzochukwu, B. S., Chinyere, M., Chinyere, O., Ibe, O. & Chinenye, O. (2016). Primary care systems profiles & performance (PRIMASYS). 1–8.

Verheyen. (2011). Thermal comfort of patients: Objective and subjective measurements in patient rooms of a Belgian healthcare facility. *Building and Environment*. 2011; 46: 1195-1204.

Yi Lu, & Seo, H. (2017). The Effect of Hospital Unit Layout on Nurse Walking Behavior. (August). https://doi.org/10.1177/193758671200600104